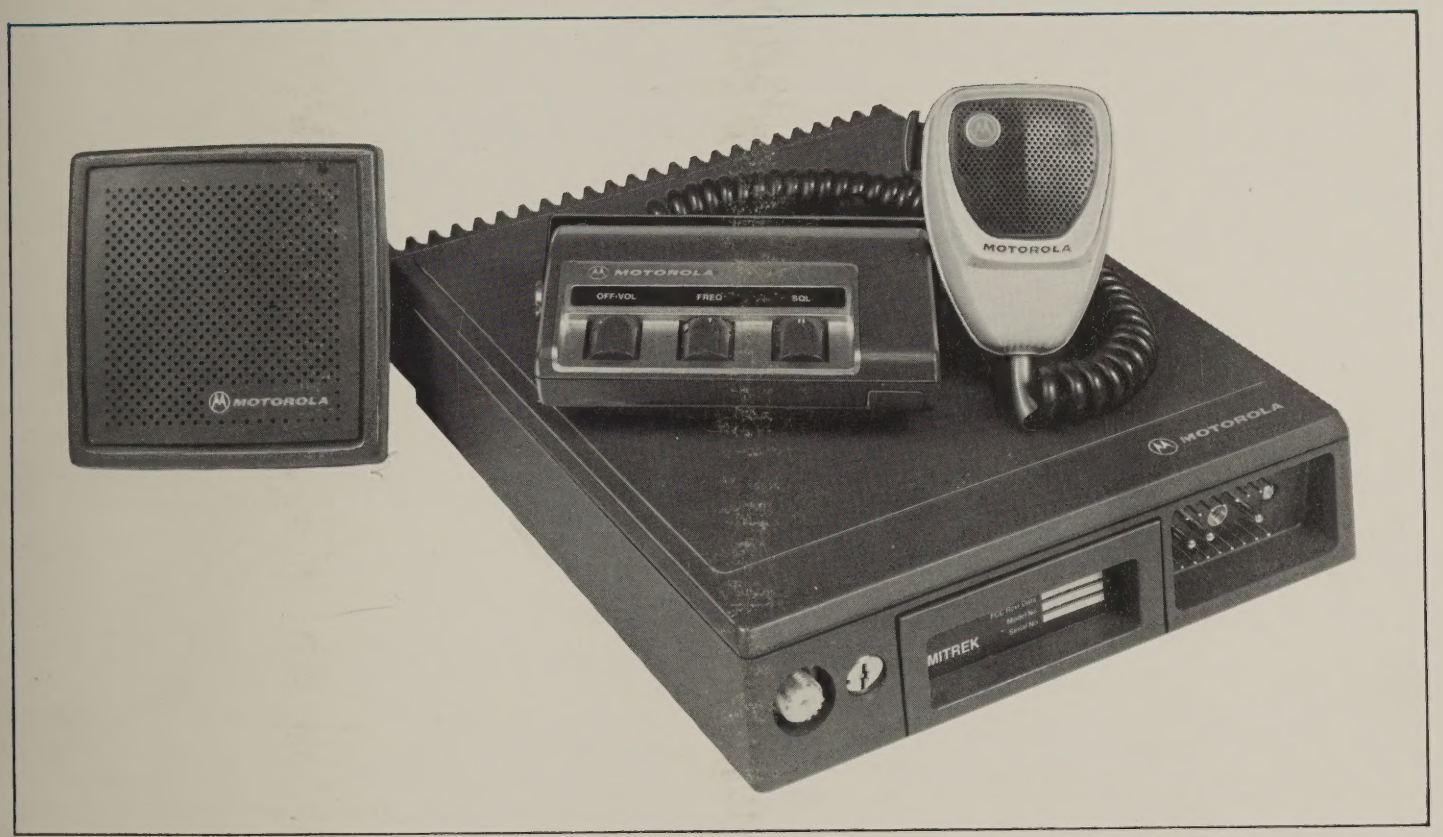
MOTOROLA

MITREK™

Two-Way FM Radio

406-420 MHz and 450-512 MHz
30/50 Watts
75/100 Watts



Instruction Manual

68P81045E75-A

OPERATION

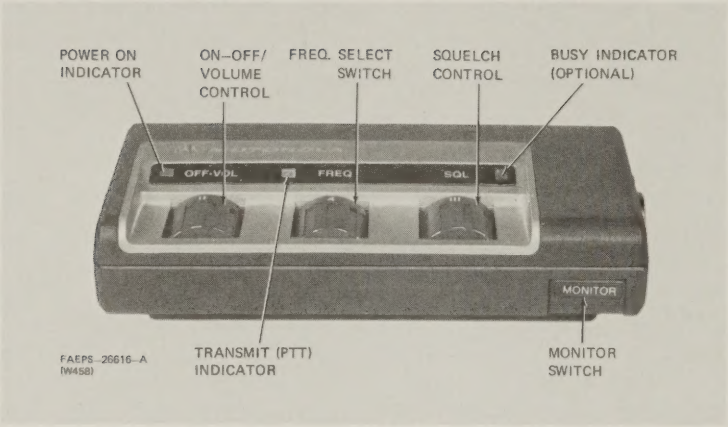


Figure 1. Operating Controls

1. RECEPTION

Step 1. Set the control head ON-OFF switch to the ON position. The receiver operates continuously while the radio is turned on.

Step 2. Select the desired radio channel.

Step 3. On "Private-Line" or "Digital Private-Line" radios remove the microphone or handset from its hang-up box. The receiver now operates with carrier squelch. All signals on the selected channel can be heard.

Step 4. Turn the SQUELCH control fully counterclockwise. Adjust the control head VOLUME control for a comfortable listening level.

Step 5. Turn the control head SQUELCH control clockwise until the speaker noise stops.

Step 6. Replace the microphone or handset in its hang-up box. If your radio is equipped with tone "Private-Line" or "Digital Private-Line" coded squelch, the receiver will now operate in the coded squelch mode; only signals from your radio system can unsquelch the receiver.

2. TRANSMISSION

Step 1. Select the desired radio channel.

Step 2. Remove the microphone or handset from its hang-up box. Monitor the channel for activity.

Step 3. If the radio channel is not in use, hold down the PTT button on the microphone or handset handle and speak slowly and distinctly into the microphone.

3. MONITOR SWITCH (PL OR DPL)

To place the radio in the monitor (carrier squelch) mode while the microphone or handset is still on-hook, press the locking MONITOR switch pushbutton to the in position. To restore coded squelch operation, press this button a second time returning it to the out position.

NOTE

If control head is not equipped with a MONITOR switch, a slide switch on the hang-up box will provide this same function.

4. BUSY LIGHT (OPTIONAL)

If your radio is equipped with the optional busy light, this feature will eliminate the need to continually recheck a busy channel to determine when it becomes idle. Any time there is traffic on the selected channel the busy light will flash; if the channel is available the lamp will be out.

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MITREK PLUS™

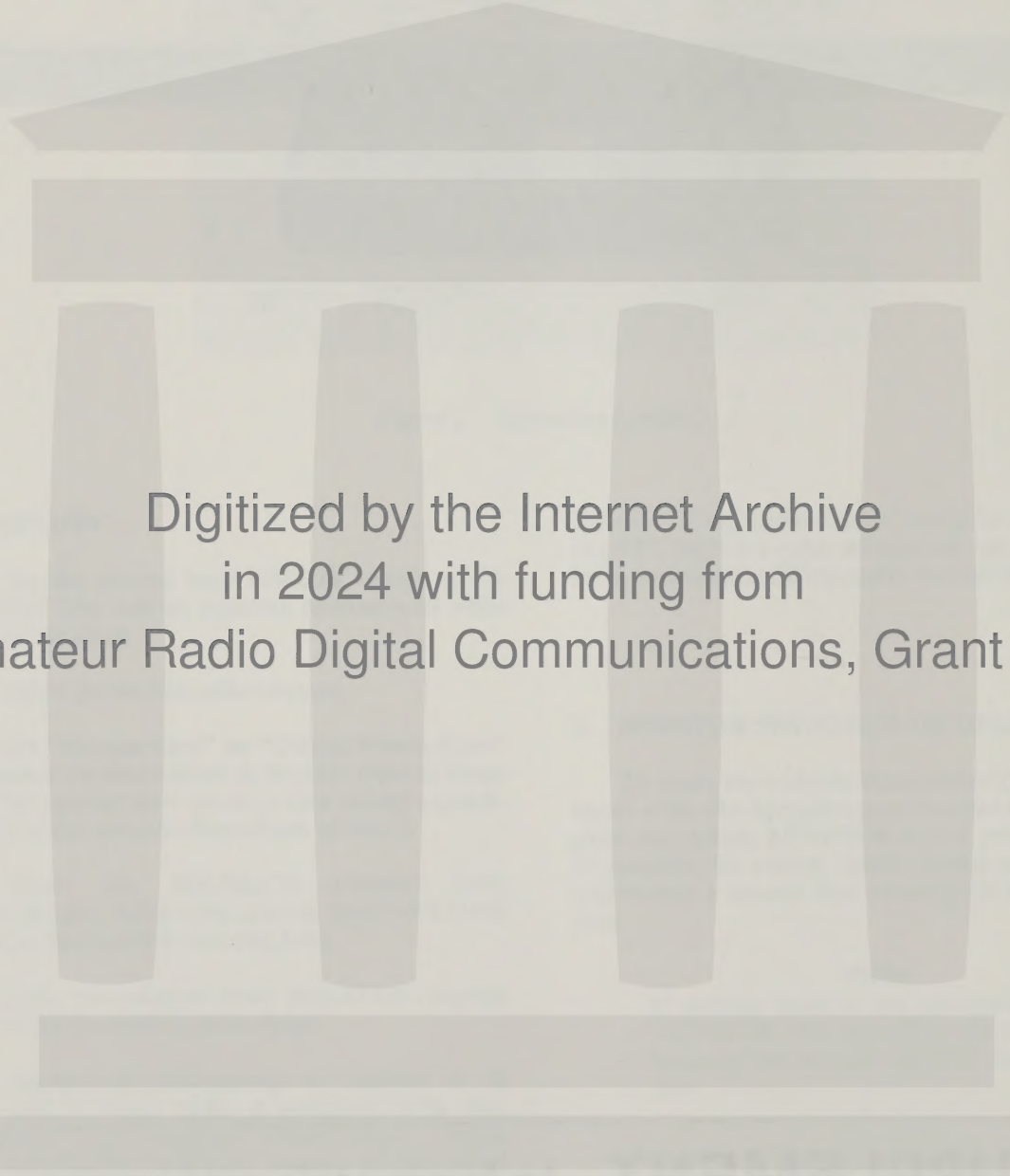
Two-Way FM Radio

Options B432 and B486

SUPPLEMENT to Instruction Manual

68P81045E65	Low Band
68P81045E70	High Band
68P81045E75	UHF Band

68P81046E05-B



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MOTOROLA INC.
Communications Group

MITREK PLUS™

OPTIONS B432 AND B486

1. DESCRIPTION

1.1 The **MITREK PLUS** radio is a mobile radio intended for use in critical applications. It is similar to the basic **MITREK** radio with enhanced specifications in three categories, (1) reduced transmitter distortion, (2) increased receiver selectivity, (3) increased audio power output with reduced distortion. This supplement defines the specific differences between **MITREK PLUS** and the basic **MITREK** radio. For all other specific details not covered in this supplement, refer to the manual for the basic **MITREK** radio of the applicable band;

Low Band	68P81045E65
High Band	68P81045E70
UHF Band	68P81045E75

1.2 Section 2 of this supplement gives the model structure differences for the **MITREK PLUS** radios. First, it gives the new models applicable to all bands, then the model differences for each band, and finally the models established for options used with the **MITREK PLUS** radios. Section 3 gives the specific differences between the **MITREK PLUS** units and the comparable units described in the **MITREK** manual. Section 4 highlights the few differences in installation procedures and section 5 gives the single difference in alignment required for the **MITREK PLUS** radio.

1.3 The specifications for the **MITREK PLUS** radios are the same as those shown for the standard **MITREK** radios except as shown in Table 1.

Table 1. MITREK PLUS Specifications

	B432	B486
Transmitter Distortion	2%	2%
Receiver Selectivity		
Low Band	100 dB (20 kHz)	100 dB (20 kHz)
High Band	100 dB (30 kHz)	100 dB (30 kHz)
UHF Band	90 dB (25 kHz)	90 dB (25 kHz)
Audio Power	12 watts	10 watts
Receiver Distortion	3%	3%

1.4 Option B486 is a special purpose radio. All **MITREK PLUS** changes are made to the radio for B486 but it uses the conventional **MITREK** cable kits shown in the **MITREK** manual. A new speaker kit (HSN4009A with radio; HSN4010A with Systems 90) is used but this high power speaker uses a two-wire cable and connects in the same manner as the conventional **MITREK** speaker.

2. MODEL COMPLEMENT

2.1 ALL BANDS

The following models are applicable to all **MITREK PLUS** models.

Table 2. Changes Applicable to All Bands

Model	Description	Replaces
HSN4007A	Speaker (B432)	HSN4000A
HSN4009A	Speaker (B486)	HSN4000A
HKN4060A	Cable, Low Power, 4-Freq.	HKN4000 A/1A
HKN4056A	Cable, High Power, 4-Freq.	HKN4016A/7A

2.2 UHF BAND

The following models are used on **MITREK PLUS** models in the UHF band.

Table 3. Changes Applicable to UHF Models

Model	Description	Replaces
HUE1073B	Chassis, 30 W, 403-420 MHz	HUE1001B
HLE4121B	Main Board, 403-420 MHz	HLE4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4195B	Hardware Kit	HLN4015B
HUE1074B	Chassis, 30 W, 450-512 MHz	HUE1002B
HLE4122B	Main Board, 450-512 MHz	HLE4002C
HLN4192A	Interconnect Board	HLN4044A
HLN4195B	Hardware Kit	HLN4015B
HUE1083B	Chassis, 50 W, 403-420 MHz	HUE1011B
HLE4121B	Main Board, 403-420 MHz	HLE4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4195B	Hardware Kit	HLN4015B
HUE1084B	Chassis, 50 W, 450-512 MHz	HUE1012B
HLE4122B	Main Board, 450-512 MHz	HLE4012C
HLN4192A	Interconnect Board	HLN4044A
HLN4195B	Hardware Kit	HLN4015B
HUE1116B	Chassis, 75/100 W, 403-420 MHz	HUE1031B
HLE4121B	Main Board, 403-420 MHz	HLE4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4198B	Hardware Kit	HLN4036B
HUE1094B	Chassis, 75/100 W, 450-512 MHz	HUE1032B
HLE4122B	Main Board, 450-512 MHz	HLE4002C
HLN4192A	Interconnect Board	HLN4044A
HLN4198B	Hardware Kit	HLN4036B

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68P81046E05-B
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2.3 HIGH BAND

The following models are used on **MITREK PLUS** models in high band.

Table 4. Changes Applicable to High Band Models

Model	Description	Replaces
HUD1053B	Chassis, 40 W, 136-146 MHz	HUD1001B
HLD4081B	Main Board, 136-146 MHz	HLD4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4194A	Hardware Kit	HLN4014A
HUD1054B	Chassis, 40 W, 146-174 MHz	HUD1002B
HLD4082B	Main Board, 146-174 MHz	HLD4002B
HLN4192A	Interconnect Board	HLN4044A
HLN4194A	Hardware Kit	HLN4014A
HUD1063B	Chassis, 60 W, 136-146 MHz	HUD1011B
HLD4081B	Main Board, 136-146 MHz	HLD4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4194A	Hardware Kit	HLN4014A
HUD1064B	Chassis, 60 W, 146-174 MHz	HUD1012B
HLD4082B	Main Board, 146-174 MHz	HLD4002B
HLN4192A	Interconnect Board	HLN4044A
HLN4194A	Hardware Kit	HLN4014A
HUD1074B	Chassis, 75/110 W, 146-174 MHz	HUD1032B
HLD4082B	Main Board, 146-174 MHz	HLD4002B
HLN4192A	Interconnect Board	HLN4044A
HLN4199A	Hardware Kit	HLN4037A
HUD1082B	Chassis, 75/110 W, 136-146 MHz	
HLD4081B	Main Board, 136-146 MHz	HLD4001C
HLN4192A	Interconnect Board	HLN4044A
HLN4199A	Hardware Kit	HLN4037A

2.4 LOW BAND

The following models are used on **MITREK PLUS** models in low band.

Table 5. Changes Applicable to Low Band Models

Model	Description	Replaces
HUB1043B	Chassis, 60 W, 29.7-39 MHz, Non-Extender	HUB1001B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4013A
HUB1044B	Chassis, 60 W, 39-50 MHz, Non-Extender	HUB1002B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4013A
HUB1053B	Chassis, 110 W, 29.7-39 MHz, Non-Extender	HUB1011B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4039A
HUB1054B	Chassis, 110 W, 39-50 MHz, Non-Extender	HUB1012B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4039A
HUB1063B	Chassis, 60 W, 29.7-39 MHz, Extender	HUB1021B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4013A
HUB1064B	Chasis, 60 W, 39-50 MHz, Extender	HUB1022B
HLN4192A	Interconnect Board	HLN4044A
HLN4193A	Hardware Kit	HLN4013A
HUB1073B	Chassis, 110 W, 29.7-39 MHz, Extender	HUB1031B
HLN4192A	Interconnect Board	HLN4044A
HLN4200A	Hardware Kit	HLN4039A
HUB1074B	Chassis, 110 W, 39-50 MHz, Extender	HUB1032B
HLN4192A	Interconnect Board	HLN4044A
HLN4200A	Hardware Kit	HLN4039A

2.5 OPTIONS

The following models were established to replace comparable models in the various **MITREK** option kits when used with the **MITREK PLUS** radios.

Table 6. Models Used with Options

Model	Description	Replaces
HSN4008A	Speaker, Systems 90, for B432	HSN4002A
HSN4010A	Speaker, Systems 90, for B486	HSN4002A
HKN4055A	Cable Kit, High Power, Positive Ground, 4-Freq., Control Head	HSN4022A
HKN4057A	Cable Kit, Low Power, Positive Ground, 4-Freq., Systems 90	HSN4009A
HKN4058A	Cable Kit, Low Power, Negative Ground, 4-Freq., Systems 90	HSN4008A
HKN4059A	Cable Kit, Low Power, Positive Ground, 4-Freq., Control Head	HSN4006A
HKN4061A	Cable Kit, High Power, Positive Ground, 4-Freq., Systems 90	HSN4024A
HKN4062A	Cable Kit, High Power, Negative Ground, 4-Freq., Systems 90	HSN4023A

3. SPECIFIC CHANGES

3.1 UHF RADIOS

3.1.1 The following parts shown in Table 7 have been added to the conventional UHF main boards to form the UHF main boards used with **MITREK PLUS** radios.

3.1.2 Part values are changed from the values used in the conventional UHF main boards to form the UHF main boards used in **MITREK PLUS**. The changed values are shown in Table 8.

3.1.3 In addition to the above changes, a new Interconnect Board HLN4192A is used with **MITREK PLUS**. This board is the same as the HLN4044A Interconnect Board except that C1 and C2 are changed to 1000 uF capacitors (Motorola Part No. 23-83210A24 or 23-80167C01).

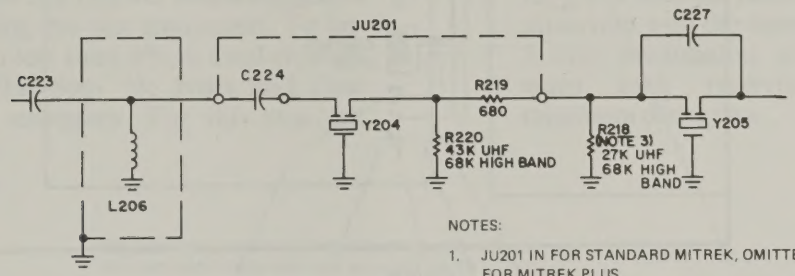
3.2 HIGH BAND RADIOS

3.2.1 The following parts shown in Table 9 have been added to the high band main boards to form the high band main boards used with **MITREK PLUS** radios.

3.2.2 The following part values are changed from the values used in the high band main boards for the high band main boards used in **MITREK PLUS**.

*Table 7. Added Parts for **MITREK PLUS** UHF Main Boards*

Reference Designation	Added From	Added To	Motorola Part No.	Description
R219	See Figure 1		6-124A45	680 ohm ± 5%
R220	See Figure 1		6-124A88	43k ± 5%
Y204	See Figure 1		48-84396K02	Coupled Resonator; 10.7 MHz



NOTES:

1. JU201 IN FOR STANDARD MITREK, OMITTED FOR MITREK PLUS.
2. C224, Y204, R219, R220, IN FOR MITREK PLUS, OMITTED FOR STANDARD MITREK.
3. R218 IS 18K IN STANDARD MITREK.

*Figure 1. Simplified Schematic Diagram for Added I-F Filter for UHF and High Band **MITREK PLUS** Radios*

*Table 8. Values Changed for **MITREK PLUS** UHF Main Boards*

Reference Designation	Motorola Part No.	Description
R218	6-124A83	27k ± 5%
U401	51-80274B01	type M7401
U402	51-80274B01	type M7401

*Table 9. Added Parts for **MITREK PLUS** High Band Main Boards*

Reference Designation	Added From	Added To	Motorola Part No.	Description
R219	See Figure 1		6-124A45	680 ohm ± 5%
R220	See Figure 1		6-124A83	27k ± 5%
Y204	See Figure 1		48-84396K02	Coupled Resonator; 10.7 MHz

*Table 10. Values Changed for **MITREK PLUS** High Band Main Boards*

Reference Designation	Motorola Part No.	Description
C227	21-82450B20	0.68 pF
R218	6-124A93	68k ± 5%
U401	51-80274B01	type M7401
U402	51-80274B01	type M7401
C208	21-84493B27	51 pF
C210	21-83406D68	24 pF
C213	21-82450B20	0.68 pF
C214	21-84493B31	57 pF, NP0
C215	21-84494B03	80 pF, NP0
C222	21-82610C71	90 pF, NP0
C223	21-84494B03	80 pF, NP0
C224	21-83406D56	24 pF
R207	6-124A93	68k ± 5%
R209	6-124A93	68k ± 5%

3.2.3 In addition to the above changes, a new Interconnect Board HLN4192A is used with **MITREK PLUS**. This board is the same as the HLN4044A Interconnect Board except that C1 and C2 are changed to 1000 uF capacitors (Motorola Part No. 23-83210A24 or 23-80167C01).

3.3 LOW BAND

3.3.1 The following part values shown in Table 11 are changed from the values used in the conventional low band **MITREK** main boards to form the low band main boards used in **MITREK PLUS**.

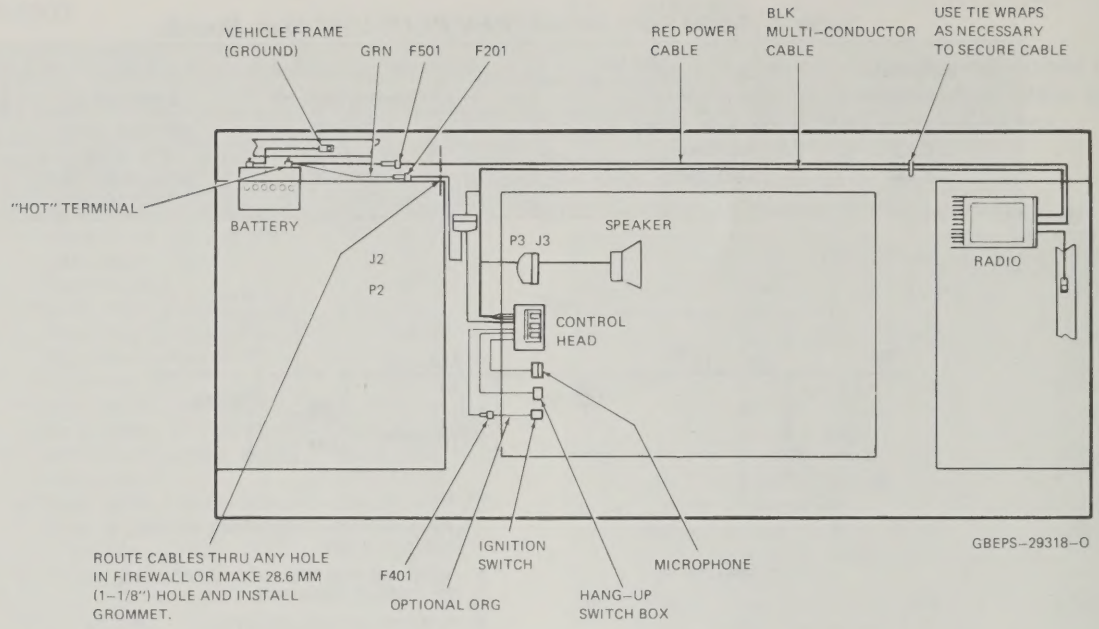


Figure 2. Power Connection Installation Details

*Table 11. Values Changed for **MITREK PLUS** Low Band Main Boards*

Reference Designation	Motorola Part No.	Description
U401	51-80274B01	type M7401
U402	51-80274B01	type M7401

3.3.2 In addition to the above changes, a new Interconnect Board HLN4192A is used with **MITREK PLUS**. This board is the same as the HLN4044A Interconnect Board except that C1 and C2 are changed to 1000 uF capacitors (Motorola Part No. 23-83210A24 or 23-80167C01).

3.4 RADIO CABLES

A new set of cables have been established to connect the **MITREK PLUS** radio to the control head or the **SYSTEMS 90** Alternate Control Module. Cable connection details are given in instruction section 68P81044E34 located at the end of this section. **SYSTEMS 90** information appears in instruction section 68P81110E50.

3.5 SPEAKERS

New speakers have been established for use with the **MITREK PLUS** radios; the HSN4007A (B432) or HSN4009A (B486) Speaker is used with the standard control head and the HSN4008A (B432) or HSN4010A (B486) is used with the **SYSTEMS 90** options. Interconnect information for the speakers is shown in the radio cable instruction section 68P81044E34. **SYSTEMS 90** information appears in instruction section 68P81110E50.

CAUTION

Be careful not to connect a **MITREK PLUS** radio to standard **MITREK** speakers that are not capable of handling the high power of **MITREK PLUS**. Only speakers capable of handling 30 watts, with an impedance of 3.2 ohms, should be connected to **MITREK PLUS** or to the **MITREK PLUS SYSTEMS 90** public address option.

3.6 HANDSET HANGUP BOX

The **MITREK PLUS** radio uses either a Model HLN4196A or HLN4197A Handset Hangup Box for the Model TMN6057A Handset. For proper application, see Note 8 in the Radio Cable section, 68P81040E34. The HLN4196A and HLN4197A are the same as the standard **MITREK** handset hangup boxes, except they both use a different cable assembly (Motorola part number 1-80705T18) instead of those indicated in the standard **MITREK** instruction manual.

4. INSTALLATION

4.1 The **MITREK PLUS** radio is installed in the same manner as the standard **MITREK** radio described in the instruction manual except for cable installation and speaker installation. Use Figure 2 in place of the power connection detail on the **MITREK** installation sheet. If routing of cables is impossible due to the Molex connectors J2 and P3, the pins can be removed from these connectors using a ST-946 Extraction Tool available from the National Parts department.

4.2 When installing the speaker, use Figure 2 in place of Detail B of the Control Head, Speaker, and Accessories section of the standard **MITREK** Installation Procedure sheet 68P81109E32.

5. ALIGNMENT

The alignment procedure for **MITREK PLUS** radios is the same as that for the conventional **MITREK** radios except that less than 3% receiver audio distortion cannot be guaranteed using this test equipment. To improve audio distortion to less than 3%, a final receiver oscillator warp step (UHF-Step 15; High and Low bands-Step 13) may be necessary. For this step, an HP331A Distortion Analyzer (or similar equipment with floating input terminals) is connected across the speaker. Proceed as follows:

For each frequency, set the rf signal generator to the carrier frequency (±30 Hz for low band or ±100 Hz for high band or UHF) and adjust signal level for 1 mV into the radio. While measuring distortion with the signal generator set for 1 kHz modulation ±3 kHz deviation, warp each receiver oscillator for minimum distortion.

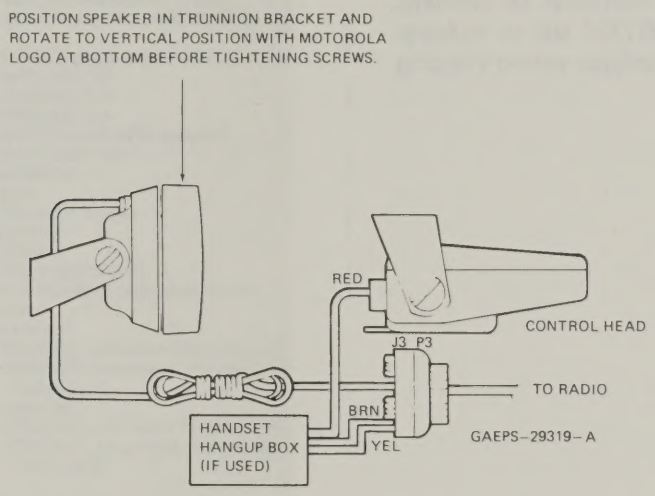


Figure 3. Control Head Connection Detail

parts list

Power High	Power Low	
HKN4055A		HKN4059A Positive Ground, Control Head
HKN4056A		HKN4060A Negative Ground, Control Head
HKN4061A		HKN4057A Positive Ground, Systems 90
HKN4062A		HKN4058A Negative Ground, Systems 90

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F201	65-86099	7.5A; 32 V
F501	65-61682	25A; 32 V (HKN4057A-4060A)
		connector, receptacle:
J2	—	consists of:
	9-80008C01	5-pin
	29-82336A01	PIN, female; 5 used
J3	—	consists of:
	9-80008C02	15-pin
	29-82336C01	PIN, female; 15 used
		connector, plug:
P1	—	consists of:
	9-801050	CONNECTOR, female; 19-contact
	15-82075D04	HOUSING, connector; left half
	15-82075D05	HOUSING, connector; right half
	2-7019	NUT, hex: 4-40 x 3/32"; 2 used
	3-135198	SCREW, machine: 4-40 x 1-1/8"; 2 us
	3-132127	
	or 3-140049	SCREW, tapping: 6-20 x 3/4"; 2 used
	4-11722	WASHER, "C"
	4-800671	WASHER, flat
	4-82113D01	WASHER, flat
	1-80701T52	SCREW and KNOB, assembly
	42-80168A01	CLIP, strain relief
P2	—	consists of:
	28-80009C01	5-pin
	29-82335A01	PIN, male; 5 used
P3	—	consists of:
	28-80009C02	15-pin
	29-82335A01	PIN, male; 15 used
P101	29-82602P01	PIN, terminal; 15 used (control head models)
or P101		consists of:
	14-84556B01	HOUSING, connector; BLK, 22-positi
	9-84151B03	CONTACT, receptacle; 20 used (Sys 90 models)
P102	—	consists of:
	14-84590B02	HOUSING, connector; BLU, 6-positio
	9-84151B03	CONTACT, receptacle; 5 used (Sys 90 models)
		wire assembly:
W1	—	CABLE, multi-conductor includes ref P3 and:
	30-84875E01	CABLE, 27-conductor; 17' (HKN4055A-4062A)
	37-82378B12	SLEEVING; GRY, 1-1/2"
	37-00061347	SLEEVING; GRY, 1" (low power only)
W2	—	LEAD and FUSE ASSEMBLY (includes ref. item F201, J2, and:
	30-10310D07	CABLE, battery; GRN, #14 ga. str.
	37-82603D04	SLEEVING, coded no. 4
	29-82602D01	TERMINAL, pin; 2 used
	37-82603D19	SLEEVING, coded no. 19
	29-136968	LUG, solder
	or 29-82607B03	LUG, ring tongue
	or 29-832914	LUG, ring tongue
	14-82883A01	INSULATOR, fuseholder cap
	14-82882A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82885A01	SPRING, fuse compression
W3	—	CABLE; includes ref item F501, W HKN4057A-4060A) and:
	14-82883A01	INSULATOR, fuseholder cap
	14-82882A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82885H01	SPRING, fuse compression
	29-84528B02	LUG, ring tongue
	30-858553	CABLE, battery: RED; 20' (HKN4 4060A)
	or 30-858552	CABLE, battery: BLK; 20' (HKN4 4059A)
	30-812505	CABLE, battery: RED; 18' (HKN4 4062A)
	or 30-851875	CABLE, battery BLK; 18' (HKN4 4061A)
W4	—	LEAD, ground consists of:
	30-858552	CABLE, battery BLK; 5-1/2' (HKN4 4060A)
	or 30-851875	CABLE, battery BLK; 5-1/2' (HKN4 4062A)
	or 30-858553	CABLE, battery RED; 5-1/2' (HKN4 4059A)
	or 30-812505	CABLE, battery; RED; 5-1/2' (HKN4 4061A)
	29-84528B05	LUG, ring tongue (HKN4055A, 4 4061A, 4062A)
	or 29-84528B02	LUG, ring tongue (HKN4057A-4061A)

MITREK PLUS™ RADIO CABLES

MODELS HKN4055-62A

FUNCTION

The radio cable interconnects the control head or the Systems 90 Alternate Control Module and the mobile speaker to the **MITREK PLUS** radio. It includes the primary power connections.

68P81044E34-B
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parts list

Power High	Power Low	
HKN4055A	HKN4059A	Positive Ground, Control Head
HKN4056A	HKN4060A	Negative Ground, Control Head
HKN4061A	HKN4057A	Positive Ground, Systems 90
HKN4062A	HKN4058A	Negative Ground, Systems 90

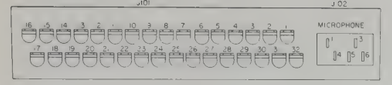
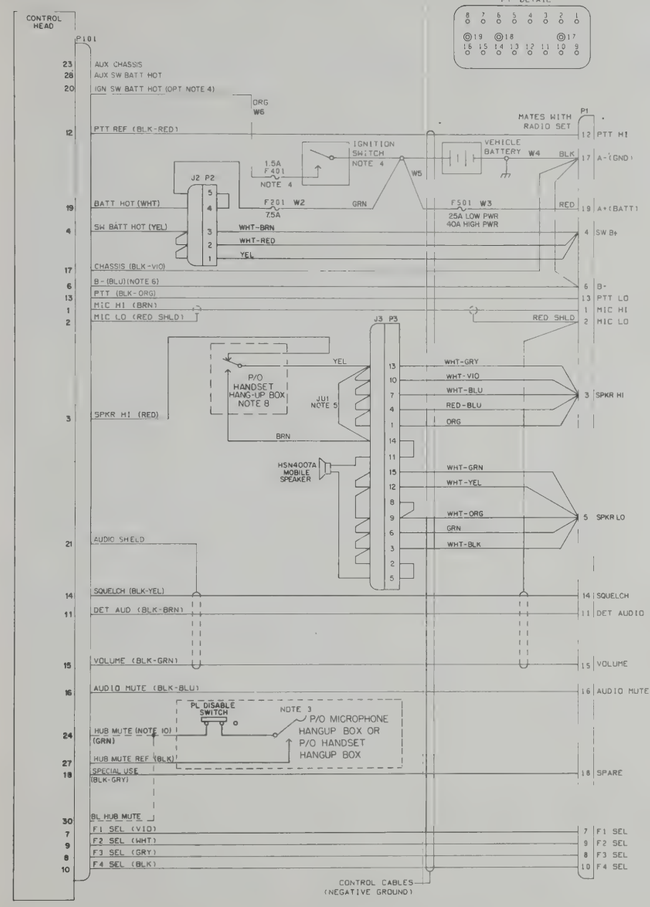
PL-6775-A

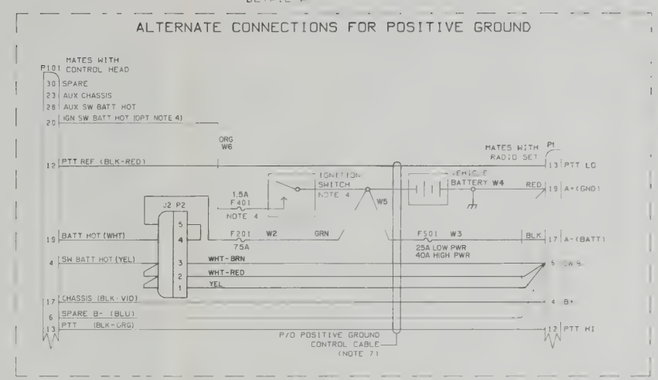
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F201	65-86099	7.5A; 32 V
F501	65-61682	25A; 32 V (HKN4057A-4060A)
		connector, receptacle:
J2	—	consists of:
	9-80008C01	5-pin
	29-82336A01	PIN, female; 5 used
J3	—	consists of:
	9-80008C02	15-pin
	29-82336C01	PIN, female; 15 used
		connector, plug:
P1	—	consists of:
	9-801050	CONNECTOR, female; 19-contact
	15-82075D04	HOUSING, connector; left half
	15-82075D05	HOUSING, connector; right half
	2-7019	NUT, hex: 4-40 x 3/32"; 2 used
	3-135198	SCREW, machine: 4-40 x 1-1/8"; 2 used
	3-132127	
	or 3-140049	SCREW, tapping: 6-20 x 3/4"; 2 used
	4-11722	WASHER, "C"
	4-800671	WASHER, flat
	4-82113D01	WASHER, flat
	1-80701T52	SCREW and KNOB, assembly
	42-80168A01	CLIP, strain relief
P2	—	consists of:
	28-80009C01	5-pin
	29-82335A01	PIN, male; 5 used
P3	—	consists of:
	28-80009C02	15-pin
	29-82335A01	PIN, male; 15 used
P101	29-82602P01	PIN, terminal; 15 used (control head models)
or P101		consists of:
	14-84556B01	HOUSING, connector; BLK, 22-position
	9-84151B03	CONTACT, receptacle; 20 used (Systems 90 models)
P102	—	consists of:
	14-84590B02	HOUSING, connector; BLU, 6-position
	9-84151B03	CONTACT, receptacle; 5 used (Systems 90 models)
		wire assembly:
W1	—	CABLE, multi-conductor includes ref item P3 and:
	30-84875E01	CABLE, 27-conductor; 17" (HKN4055A-4062A)
	37-82378B12	SLEEVING; GRY, 1-1/2"
	37-00061347	SLEEVING; GRY, 1" (low power only)
W2	—	LEAD and FUSE ASSEMBLY (GRN) includes ref. item F201, J2, and:
	30-10310D07	CABLE, battery; GRN, #14 ga. str.
	37-82603D04	SLEEVING, coded no. 4
	29-82602D01	TERMINAL, pin; 2 used
	37-82603D19	SLEEVING, coded no. 19
	29-136968	LUG, solder
	or 29-82607B03	LUG, ring tongue
	or 29-832914	LUG, ring tongue
	14-82883A01	INSULATOR, fuseholder cap
	14-82882A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82885A01	SPRING, fuse compression
W3	—	CABLE; includes ref item F501, W5 (on HKN4057A-4060A) and:
	14-82883A01	INSULATOR, fuseholder cap
	14-82882A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82885H01	SPRING, fuse compression
	29-84528B02	LUG, ring tongue
	30-858553	CABLE, battery: RED; 20" (HKN4058A, 4060A)
	or 30-858552	CABLE, battery: BLK; 20" (HKN4057A, 4059A)
	30-812505	CABLE, battery: RED; 18" (HKN4056A, 4062A)
	or 30-851875	CABLE, battery BLK; 18" (HKN4055A, 4061A)
W4	—	LEAD, ground consists of:
	30-858552	CABLE, battery BLK; 5-1/2" (HKN4058A, 4060A)
	or 30-851875	CABLE, battery BLK; 5-1/2" (HKN4056A, 4062A)
	or 30-858553	CABLE, battery RED; 5-1/2" (HKN4057A, 4059A)
	or 30-812505	CABLE, battery; RED; 5-1/2" (HKN4055A, 4061A)
	29-84528B05	LUG, ring tongue (HKN4055A, 4056A, 4061A, 4062A)
	or 29-84528B02	LUG, ring tongue (HKN4057A-4061A)

HKN4040A Fused Lead, Positive Ground
HKN4041A Fused Lead, Negative Ground

PL-6245-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F501	65-61683	FUSE: 40A; 32 V
W5	—	LEAD, fused; consists of:
	30-812505	CABLE, battery: RED; 2-1/2" (used on HKN4056A, 4062A)
	or 30-851875	CABLE, battery: BLK; 2-1/2" (used on HKN4055A, 4061A)
	29-84528B05	LUG, ring tongue
	9-84277B01	RECEPTACLE, fuse
	3-400465	SCREW, tapping
	42-84275B01	RETAINER, fuse
	38-84363D01	CAP, protection

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
W5	—	Part of W3 for low power radios (HKN4057A-4060A) HKN4041A for high power negative ground (used with HKN4056A, 4062A) HKN4040A for high power positive ground (used with HKN4055A, 4061A)
W6	—	p/o Ignition sense lead option. See Accessories section 68P81039E26 in the Servicing manual.





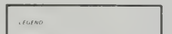
NOTES:

1. Unless otherwise specified:
   Resistor values are in ohms.
   Capacitor values are in microfarads.
2. S103 is normally used for PL monitor. However, it may be used as a spare switch for special purpose. In this case JU104 is installed to complete audio mute path to hangup box.
3. Mic hangup box used for PL/DPL radios:
   Hangup box shown off-hook. If S103 is omitted or used for special purpose, a HLN4025A Hangup Box is used. This hangup box includes a slide switch for PL monitor.
4. Orange ignition switch wire is optional. When this option is installed, transmitter use requires ignition switch to be on; radio may be used in receive only mode with ignition switch off. JU101 must be omitted.
5. JU1 (J3-11 to J3-13) omitted when handset hangup box is used.
6. Omitted.
7. Detail A shows connection differences for positive ground cables. All other connections are identical to those shown for negative ground control cables at left.
8. The HLN4197A Handset Hang-Up Box is normally used in handset applications (hookswitch shown in off-hook position). An HLN4196A Handset Hang-Up Box is used when S103 on the control head is not used for MONITOR.
9. Omitted.
10. When optional busy light circuit is used, hangup box mute lead (grn) is connected to pin 30 instead of pin 24.

EEPS-29330-B

Control Cable Model Chart

Model	Length (Feet)	No. of Channels (Note 8)	Ground Polarity (Note 7)	Power	Type
HKN4055A	17	4	+	High	Cont. Head
HKN4056A	17	4	—	High	Cont. Head
HKN4057A	17	4	+	Low	Sys. 90
HKN4058A	17	4	—	Low	Sys. 90
HKN4059A	17	4	+	Low	Cont. Head
HKN4060A	17	4	—	Low	Cont. Head
HKN4061A	17	4	+	High	Sys. 90
HKN4062A	17	4	—	High	Sys. 90



MITREK PLUS™ RADIO CABLES

MODELS HKN4055-62A

FUNCTION

The radio cable interconnects the control head or the Systems 90 Alternate Control Module and the mobile speaker to the **MITREK PLUS** radio. It includes the primary power connections.

MITREK PLUS RADIO CABLES

68P81044E34-B
2-13-84 GGI

MITREK PLUS™
Two-Way FM Radio
Options B432 and B486

68P81046E05-B

MOTOROLA INC.

Communications Group

instruction manual revision

Supersedes ***WMR-0048***

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct the manual accordingly.

INSTRUCTION MANUALS AFFECTED:

68P81045E65-O	*Mitrek* Two-Way FM Radio, 29.7 – 50 MHz
68P81045E70-O	*Mitrek* Two-Way FM Radio, 136 – 174 MHz
68P81045E75-A	*Mitrek* Two-Way FM Radio, 406 – 420 MHz and 450 - 512 MHz

REVISION DETAILS:

In your manual, add the attached Instruction Section 68P81039E24-F (Sheet 1 of 2 and Sheet 2 of 2), and delete Instruction Section 68P81039E24-C/E (Sheet 1 of 2 and Sheet 2 of 2).

technical publication services
Address inquiries to:
MOTOROLA, INC.
5555 N. Beach Street
Fort Worth, Texas 76137
Attn:- Technical Publication Services

WMR-0100
6-5-84 GGI

"MITREK" CONTROL HEADS

MODELS HCN4000-11A

"MITREK" RADIO CABLES

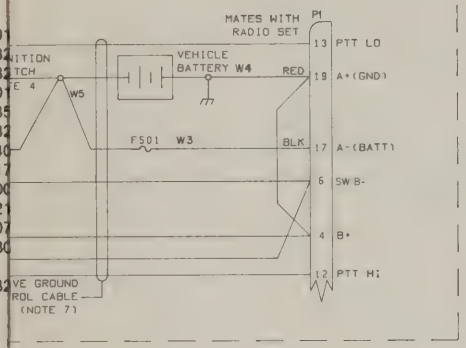
MODELS HKN4000-6A

HKN4016-22A

parts list

Low Power	High Pow
HKN4000A,	HKN4016A
HKN4001A,	HKN4017A
HKN4002A,	HKN4018A
HKN4003A,	HKN4019A
HKN4004A,	HKN4020A
HKN4005A,	HKN4021A
HKN4006A,	HKN4022A

REFERENCE SYMBOL	MS FOR POSITIVE GROUND P (OPTION)
F201	65-86
F501	65-61
	or 65
P1	
	9-801
	15-82
	15-82
	2-701
	3-135
	3-132
	3-140
	4-117
	4-800
	4-821
	1-807
	42-80
P101	
	29-82
W1	
	30-85
	30-86
	30-86
	30-86
W2	1-807
	29-82
	37-82
	37-13
	29-13
	29-82
	29-86
	14-82
	14-82
	42-82
	41-82
W3	
	14-82
	14-82
	42-82
	41-82
	29-84
	30-85
	or 30
	or 30
	or 30
	or 30
	or 30
	30-81
	or 30
	or 30
	or 30
	or 30
	or 30
W4	
	30-85
	or 30
	or 30
	30-81
	29-84
W5	

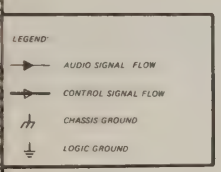


VOLTAGE NOTES

DC voltages measured with 20 K-ohm/volt multimeter referenced to B

Supply voltage during receive mode is 13.8 V.
Supply voltage during transmit mode is 13.6 V in Low Power Radios and 13.4 V in High Power Radios.

EEPS-30849-0



FUNCTION

The control head provides control of the trunk-mounted radio from the vehicle passenger compartment. It controls frequency selection, volume, and squelch. a PL MONITOR switch is provided for "Private-Line" radios. The radio cable interconnects the control head and radio and includes primary power connections.

parts list

Low Power High Power

HKN4000A, HKN4016A Control Cable (1-Freq.) 17'
HKN4001A, HKN4017A Control Cable, (4-Freq.) 17'
HKN4002A, HKN4018A Control Cable, Negative Ground (4-Freq.) 22'
HKN4003A, HKN4019A Control Cable, Positive Ground (4-Freq.) 22'
HKN4004A, HKN4020A Control Cable, Negative Ground (4-Freq.) 10'
HKN4005A, HKN4021A Control Cable, Positive Ground (4-Freq.) 10'
HKN4006A, HKN4022A Control Cable, Positive Ground (4-Freq.) 17' PL-6062-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F201	65-88099	**fuse:** 7.5A, 32 V
F501	65-81682	25A, 32 V (HKN4000A-4006A)
	or 65-81683	40A,32 V (HKN4016-4022A)
P1		**connector, plug:** consists of:
	9-801050	CONNECTOR, female, 19-contact
	15-82075004	HOUSING, connector; left half
	15-82075005	HOUSING, connector; right half
	2-70119	NUT, hex 4-40 x 3/32", 2 used
	3-135198	SCREW, machine: 4-40 x 1-1/8"; 2 used
	3-132127 or	
	3-140049	SCREW, tapping: 6-20 x 3/4"; 2 used
	4-11722	WASHER, "C"
	4-800871	WASHER, flat
	4-82113D01	WASHER, flat
	1-80701T32	SCREW and KNOB, assembly
	42-9018BA02	CLIP, strain relief
P101		consists of:
	29-82602D01	PIN, terminal female; 15 used
W1		**wire assembly:** multi-conductor cable consists of
	30-858513	CABLE, 13-conductor; 17' used (HKN4000A, 4016A)
	30-864650	CABLE, 17-conductor; 17' used (HKN4001A, 4006A, 4017A, 4022A)
	30-864650	CABLE, 17-conductor; 22' used (HKN4002A, 4003A, 4018A, 4019A)
	30-864650	CABLE, 17-conductor; 10' used (HKN4004A, 4005A, 4020A, 4021A)
W2	1-80701T28	LEAD and FUSE ASSEMBLY (green) includes ref. item F201 and
	29-82602D01	TERMINAL, pin
	37-82603D19	SLEEVING, coded no. 19
	27-132562	TUBING, heat shrink
	29-136968	LUG, solder
	29-82445A06	LUG, ring tongue
	29-865056	LUG, ring tongue
	14-82863A01	INSULATOR, fuseholder cap
	14-82862A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82860A01	SPRING, fuse compression
W3		CABLE, includes ref. items F501 and W5 (on HKN4020A-4006A) and
	14-82863A01	INSULATOR, fuseholder cap
	14-82862A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82860H01	SPRING, fuse compression
	29-84528B02	LUG, ring tongue
	30-858553	CABLE, battery: red; 24' (HKN4000A, 4001A)
	or 30-858553	CABLE, battery: red, 22' (HKN4002A)
	or 30-858553	CABLE, battery: red; 13' (HKN4004A)
	or 30-858552	CABLE, battery blk, 20' (HKN4006A)
	or 30-858552	CABLE, battery blk, 27' (HKN4003A)
	or 30-858552	CABLE, battery blk, 13' (HKN4005A)
	30-812505	CABLE, battery: red; 18' (HKN4016A, 17A)
	or 30-812505	CABLE, battery red, 24-1/2' (HKN4018A)
	or 30-851875	CABLE, battery blk, 24-1/2' (HKN4019A)
	or 30-812505	CABLE, battery red, 10-1/2' (HKN4020A)
	or 30-851875	CABLE, battery blk, 10-1/2' (HKN4021A)
	or 30-851875	GROUND LEAD consists of
W4	30-858552	GROUND LEAD consists of CABLE, battery blk, 5-1/2' (HKN4000A, 4001A, 4002A, 4004A)
	or 30-851875	CABLE, battery blk, 5-1/2" (HKN4016A, 4017A, 4018A, 4020A)
	or 30-858553	CABLE, battery red, 5-1/2' (HKN4003A, 4005A, 4006A)
	30-812505	CABLE, battery; red; 5-1/2' (HKN4019A, 4021A, 4022A)
	29-84528B02	LUG, ring tongue (HKN4000A-4006A)
W5		Part of W3 for low power radios, HKN4000A-4006A; HKN4041A for high power negative ground HKN4040A for high power positive ground

HCN4000A through HCN4019A *Mitrek* Control Head PL-6051-F

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed
C101	23-84665F01	10 μF, + 100, – 10%, 25 V
C102	23-84665F04	1 μF, + 150, – 10%, 50 V
		lamp, subminiature
DS104, 105	65-83376K01	08A, 14 V
DS106	65-83376K01	08A, 14 V (busy light models only)
J101	1-80703T51	**connector, receptacle** 32-contact female includes J102, 5-contact male
		resistor, fixed, ± 5%, ½ W unless otherwise stated
R101	18-80126A03	variable 25k, includes switch S101
R102	18-80126A01	variable 25k
R103	6-11009C39	270
R104	6-11009C61	3.3k
R105, 106	6-11009C73	10k
R107	6-125C19	56 ± 10%, ½ W
R108	6-11009C61	3.3k
R109	6-11009C97	100k
R110	6-11009C81	22k
R111	6-11009C49	1k
R112	6-11009C81	22k
R113	6-11009C90	51k
R114	6-11009C46	750
R115	6-11009C51	1.2k
R116	6-11009C57	2.2k
R117, 118	6-11009C73	10k
R119	6-11009C71	8.2k
		diode (see note)
CR101, 103	48-83654H02	silicon
CR104, 107	48-83654H01	silicon
VR102	48-82256C15	**voltage regulator (see note)** zener type, 5.1 V
Q101	48-869643	**transistor (see note)** PNP, type M9643
U101	51-84631K76	**integrated circuit (see note)** type MD176
		switch
S101	—	on-off, p.o R101
S102	40-80111A03	5-position rotary (5-frequency models only, see note 6)
	or 40-80111A01	4-position rotary (4-frequency models only)
S103	40-81027A01	dpst pushbutton

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number

HKN4040A Fused Lead, Positive Ground
HKN4041A Fused Lead, Negative Ground PL-6245-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
F501	65-81683	FUSE 40A, 32 V
W5	—	LEAD, fused, consists of
	30-812505	CABLE, battery: RED, 2-1/2' (used on HKN4056A, 4062A)
	or 30-851875	CABLE, battery: BLK, 2-1/2' (used on HKN4055A, 4061A)
	29-84528B05	LUG, ring tongue
	9-54277B01	RECEPTACLE, fuse
	3-400483	SCREW, tapping
	42-84275B01	RETAINER, fuse
	38-84383D01	CAP, protection

CONTROL HEAD MODEL CHART

* MODEL	LOW POWER	TYPE (NOTE 5)	CHANNEL SPACING (NOTE 6)	WEATHER RESISTANT	BUSY LIGHT (NOTE 5)
HCN4000A	CS		1	YES	NO
HCN4001A	CS		4	YES	NO
HCN4002A	PLC/PL		1	YES	NO
HCN4003A	PLC/PL		4	YES	NO
HCN4004A	PLC/PL		1	NO	NO
HCN4005A	PLC/PL		4	NO	YES
HCN4006A	PLC/PL		1	YES	YES
HCN4007A	PLC/PL		4	YES	YES
HCN4008A	CS		1	NO	NO
HCN4009A	CS		4	NO	NO
HCN4010A	PLC/PL		1	NO	NO
HCN4011A	PLC/PL		4	NO	NO
HCN4016A	CS		1	YES	NO
HCN4017A	PLC/PL		4	YES	NO
HCN4018A	PLC/PL		1	NO	YES
HCN4019A	PLC/PL		4	NO	YES
HCN4020A	PLC/PL		1	YES	NO
HCN4021A	PLC/PL		4	YES	NO
HCN4022A	PLC/PL		1	NO	NO

TABLE II. COMPARATOR VOLTAGE (U101A-3)

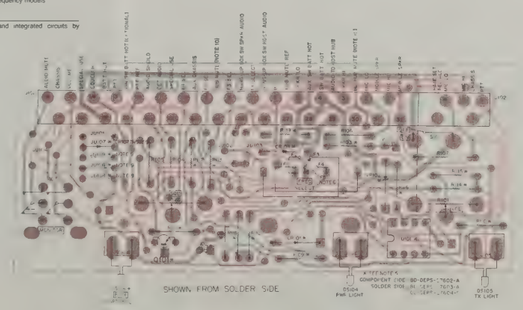
SQUELCH CONDITION	MICROPHONE ON-HOOK	MICROPHONE OFF-HOOK
FULL SQUELCH	1.5 V	1.5 V
SPEECH/CORD	4.8 V	4.4 V

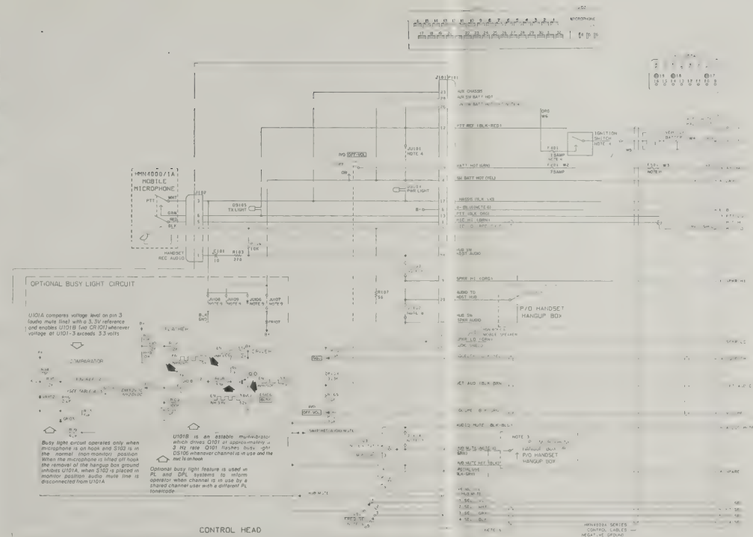
JUMPER TABLE

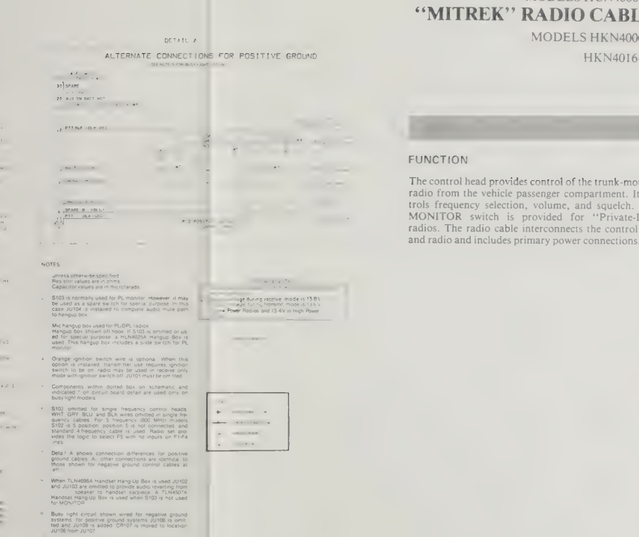
JUMPER NORMALLY		FUNCTION
JU101	IN	SUPPLIES PTT CURRENT
JU102	IN	IN HANDSET APPLICATIONS MAY BE OMITTED TO DISABLE SPEAKER WITH HANDSET OFF-HOOK
JU103	IN	IN HANDSET APPLICATIONS MAY BE OMITTED TO DISABLE HANDSET
JU104	OUT	IN HANDSET APPLICATIONS MUST BE INSTALLED TO COMPLETE AUDIO MUTE PATH TO HANGUP BOX WHEN S103 NOT USED FOR MONITOR (NOTE 2)
JU105	OUT	DIODE FOR POSITIVE GROUND
JU107	IN	DELETED FOR POSITIVE GROUND
JU108	IN	DELETED FOR POSITIVE GROUND
JU109	OUT	ADDED FOR POSITIVE GROUND

CONTROL CABLE MODEL CHART

MODEL HIGH POWER	MODEL LOW POWER	LENGTH (FEET)	NO. OF CONDUCTORS	SCHEMATIC (NOTE 7)
HKN4016A	HKN4000A	17	13	*
HKN4017A	HKN4001A	17	17	*
HKN4018A	HKN4002A	22	17	*
HKN4019A	HKN4003A	22	17	*
HKN4020A	HKN4004A	10	13	*
HKN4021A	HKN4005A	10	17	*
HKN4022A	HKN4006A	17	17	*







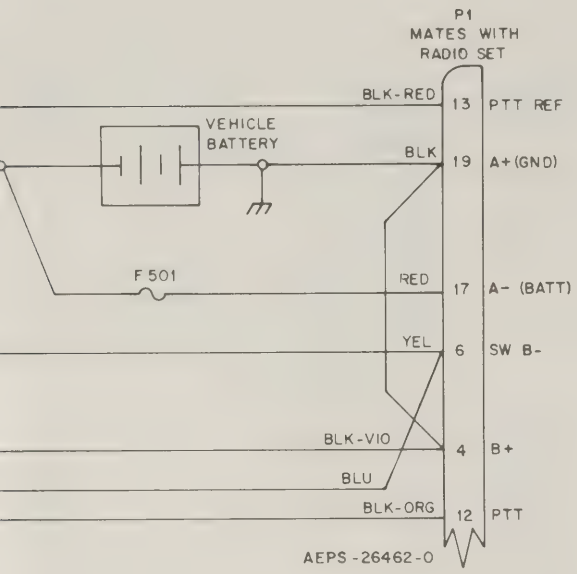
"MITREK" CONTROL HEADS
MODELS HCN4000-11A
"MITREK" RADIO CABLES
MODELS HKN4000-6A
HKN4016-22A

FUNCTION

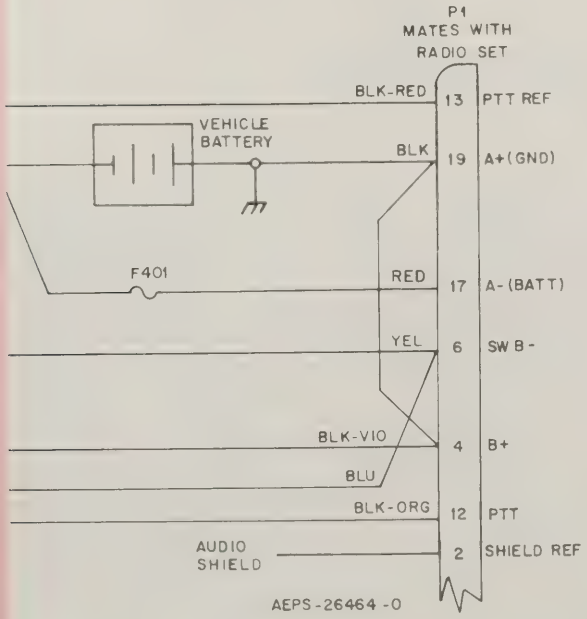
The control head provides control of the trunk-mounted radio from the vehicle passenger compartment. It controls frequency selection, volume, and squelch. a PL MONITOR switch is provided for "Private-Line" radios. The radio cable interconnects the control head and radio and includes primary power connections.

CONTROL HEAD AND CABLES

GATIVE GROUND MITREK CABLE MODIFIED R POSITIVE GROUND INSTALLATION



SITIVE GROUND MOCOM•70 CABLE DIFIED FOR POSITIVE GROUND MITREK IN- LLATION



MOTOROLA INC.

Communications Group

instruction manual revision

Supersedes ***WMR-0008***

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct the manual accordingly.

INSTRUCTION MANUALS AFFECTED:

68P81045E65-O	*Mitrek* Two-Way FM Radio, 29.7 – 50 MHz
68P81045E70-O	*Mitrek* Two-Way FM Radio, 136 – 174 MHz
68P81045E75-A	*Mitrek* Two-Way FM Radio, 406 – 420 MHz and 450 - 512 MHz

REVISION DETAILS:

In your manual, delete Instruction Sections 68P81106E97-B and 68P81039E26-C/G, and add the attached Instruction Sections 68P81106E97-B and 68P81039E26-H.

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WMR-0099
4-3-84 GG

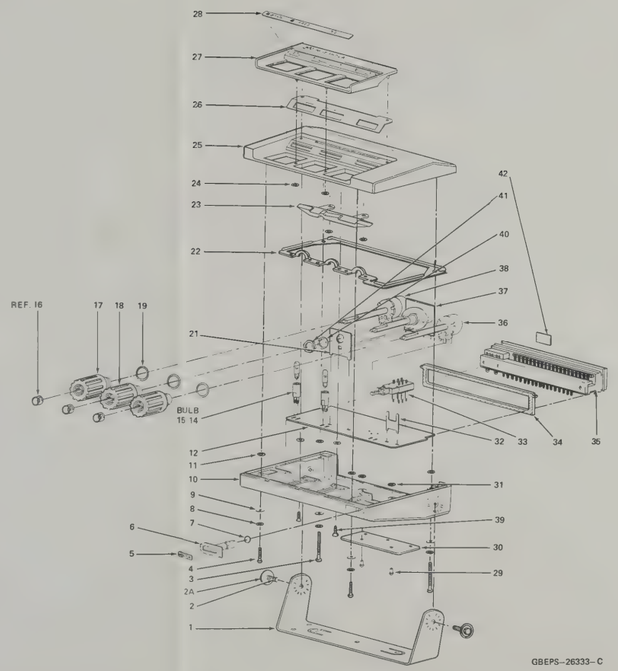
"MITREK" CONTROL HEAD

MECHANICAL PARTS

parts list

Control Head Mechanical Parts List PL 6068 E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	7-80117A01	trunnion bracket
2	3-135726	screw for trunnion, 2 used
2A	4-135784	washer for trunnion, 2 used
3	3-10903B62	machine screw for rear housing (M 3.5 x 0.6 x 30), 2 used
4	3-10903B12	machine screw for front housing (M 35 x 0.6 x 13), 2 used
5	33-80117A01	monitor nameplate (decal)
6	36-80102A01	pushbutton (PL models only)
	or 36-80127A02	pushbutton (CS models only)
7	42 1012BA22	o-ring (weather-resistant models only)
8	4 7669	lockwasher for housing screws, 4 used
9	4 13929C	flat washer for housing screws, 4 used
10	13-80126A01	bottom housing
11	4-80149A01	captive washer for housing screws, 6 used
12	84 80112A01	printed circuit board
14	5 8001180	light socket without busy light option, 2 used
15	65-8337bK01	light bulb without busy light option, 2 used with busy light option, 3 used
16	42 10082A14	knob (retainer installed by vendor), 3 used
17	36-8010A01	volume squelch knob
18	36-80107A02	frequency knob
19	42-1012BA23	o-ring (weather-resistant models only), 3 used for multiple-frequency 2 used for single-frequency
20	57-80208A01	gasket to isolate light
21	7-8016A01	frequency switch bracket
22	32 8001B01	housing gasket
23	61-80119A01	lens
24	42-1013A31	retainer ring for bezel and lens, 6 used
25	15-80108A01	top housing
26	32-80140B01	adhesive strip for bezel (non-weather resistant models only)
27	13-80180A01	bezel (multiple frequency, weather resistant models)
	or 13 8018BA02	bezel (single frequency, weather-resistant models)
	or 13-80114A01	bezel (multiple-frequency non-weather-resistant models)
	or 13-80114A02	bezel (single frequency, non-weather resistant models)
28	33-80116A02	overlay nameplate for bezel (one frequency models without busy light option)
	or 33 80116A01	overlay nameplate for bezel (four-frequency models without busy light option)
	or 33-80116A05	overlay nameplate for bezel (four-frequency models with busy light option)
	or 33-80116A06	overlay nameplate for bezel (one frequency models with busy light option)
29	5-7703	rivet for strain relief bracket, 2 used
30	7-80100A01	strain relief bracket
31	4-7555	flat washer for strain relief bracket, 2 used
32	7-80159A01	pushbutton switch bracket
33	40-80127A01	pushbutton switch S103
34	32-8003BC01	connector gasket (weather resistant models only)
35	1-8070J751	connector J101
36	18-80126A01	rotary potentiometer R102
37	40-80111A01	rotary switch S102 (see electrical parts list)
38	18-80126A02	rotary potentiometer R101 (p-o S101),
39	3-10906B04	flathead machine screw for front housing, (M3.5 x 0.6 x 13), 2 used
40	4-7655	lockwasher for frequency switch bracket
41	2-1376	nut for frequency switch bracket
42	32-80131B01	microphone gasket (weather-resistant models only)
	non-referenced items	
	3-139913	tapping screw (8-15 x ½"), 2 used
	3-136756	tapping screw (10-16 x ¾"), 3 used
	3[80118A01	grommet
	38-8438D02	protective cap
	42 10113A32	retainer ring



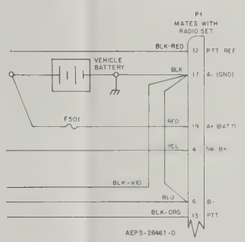
FIELD CONVERSION OF RADIO CABLES

In some instances, it may be necessary or desirable to make field conversion of cables to facilitate a particular installation. Two examples of this would be to install a new MITREK radio in a positive ground vehicle when only a negative ground cable was available or to retrofit a MITREK radio into an existing positive ground MOCOM•70 installation. In both of these the resulting cable should be clearly tagged as its wire colors will not match any existing documentation.

NOTE

When converting to positive ground, JU1 on the interconnect board in the radio must be cut.

NEGATIVE GROUND MITREK CABLE



CONVERSION PROCEDURE

Step 1. Unsolder the wires from the following pins at the connector to the radio set:

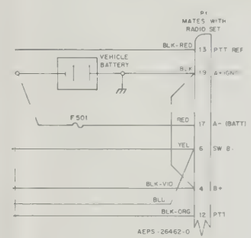
Wire Color	*Pin*
Blk-Red	12
Blk, Blk-Vio, Jumper	17
Red	19
Yel	4
Blu, Jumper	6
Blk-Org	13

Step 2. Resolder the wires to the following pins:

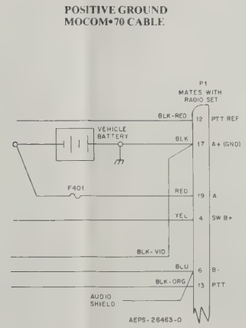
Wire Color	*Pin*
Blk-Red	13
Blk, Jumper	19
Red	17
Yel, Blu	6
Blk-Vio, Jumper	4
Blk-Org	12

Step 3. Attach a tag to the cable near the radio connector documenting the changes thatg have been made.

NEGATIVE GROUND MITREK CABLE MODIFIED FOR POSITIVE GROUND INSTALLATION



POSITIVE GROUND MOCOM•70 CABLE



CONVERSION PROCEDURE

Step 1. Unsolder the wires from the following pins at the connector to the radio set:

Wire Color	*Pin*
Blk-Red	12
Blk, Blk-Vio,	17
Red	19
Yel	4
*Blu, Audio Shield	6
Blk-Org	13

*Blu lead may be omitted on single frequency models.

Step 2. Resolder the wires to the following pins

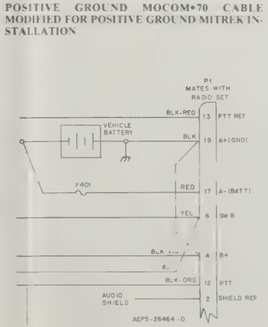
Wire Color	*Pin*
Blk-Red	13
Blk	19
Red	17
Yel, Blu*	6
Blk-Vio	4
Blk-Org	12
Audio Shield	2

*Blu lead may be omitted on single frequency models.

Step 3. Solder a short jumper (insulated #24 or larger wire) between pin 4 and pin 19.

Step 4. Attach a tag to the cable near the radio connector documenting the changes that have been made.

POSITIVE GROUND MOCOM•70 CABLE MODIFIED FOR POSITIVE GROUND MITREK INSTALLATION



MOTOROLA INC.
Communications Group

instruction manual revision

Supersedes ***WMR-0008***

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct the manual accordingly.

INSTRUCTION MANUALS AFFECTED:

68P81045E65-O	*Mitrek* Two-Way FM Radio, 29.7 – 50 MHz
68P81045E70-O	*Mitrek* Two-Way FM Radio, 136 – 174 MHz
68P81045E75-A	*Mitrek* Two-Way FM Radio, 406 – 420 MHz and 450 - 512 MHz

REVISION DETAILS:

In your manual, delete Instruction Sections 68P81106E97-B and 68P81039E26-C/G, and add the attached Instruction Sections 68P81106E97-B and 68P81039E26-H.

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WMR-0099
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"DIGITAL PRIVATE-LINE" TWO-CODE ADAPTER

MODEL TLN5730A

APPLICATION —

Plugs into code plug receptacle on "Digital Private-Line" decoder or encoder-decoder to allow separate "Digital Private-Line" codes for transmit and receive. Code plugs for the two codes then plug into the receptacles on the two-code adapter board.

parts list

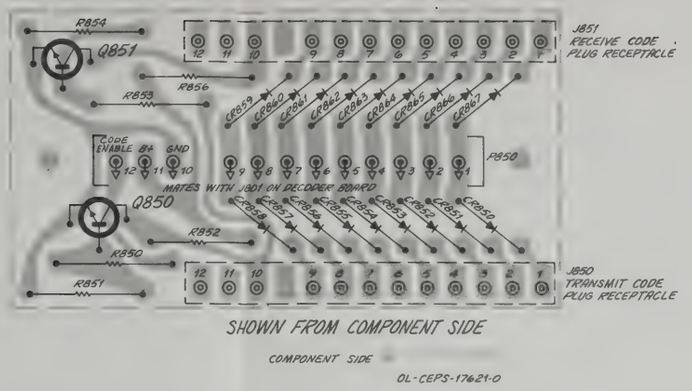
TLN5730A 2-Code Adapter Board — PL-3414-O

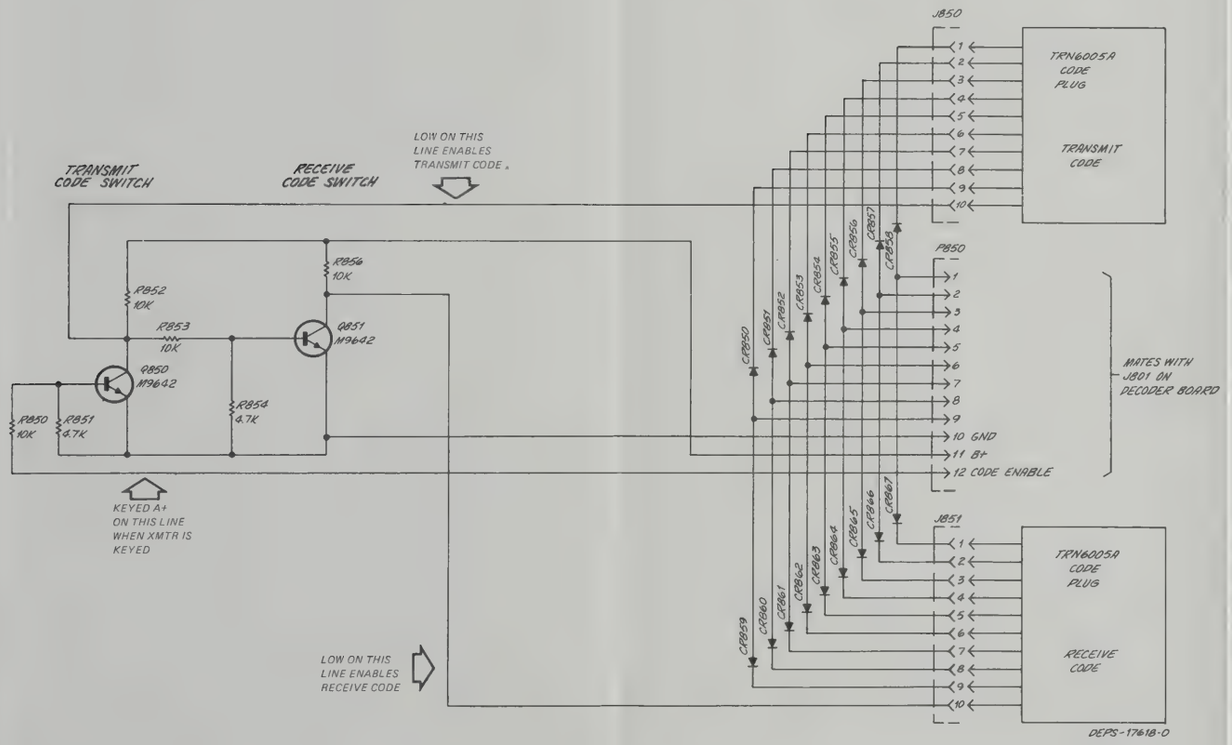
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode (see note):
CR850 – 867	48-83654H01	silicon
		connector, receptacle:
J850, 851	9-82071K01	female; 12-contact
		connector, plug:
P850		consists of:
	28-82070K01	CONTACT, male; 13 req'd
		transistor (see note):
Q850, 851	48-869642	NPN; type M9642
		resistor, fixed:
R850, 852, 853, 856	6-124A73	10k ±5%; ¼ W
R851, 854	6-124A65	4.7k ±5%; ¼ W
	non-referenced items	
	1V80769B88	CIRCUIT BOARD ASSY., incl. referenced item P850
	3-138804	SCREW, machine (4-40 x 5/16"); 2 req'd.

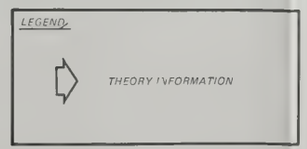
note: For best performance, order diodes and transistors by Motorola part number.

"DIGITAL PRIVATE-LINE" TWO-CODE ADAPTER

MODEL TLN5730A







APPLICATION —

Plugs into code plug receptacle on "Digital Private-Line" decoder or encoder-decoder to allow separate "Digital Private-Line" codes for transmit and receive. Code plugs for the two codes then plug into the receptacles on the two-code adapter board.

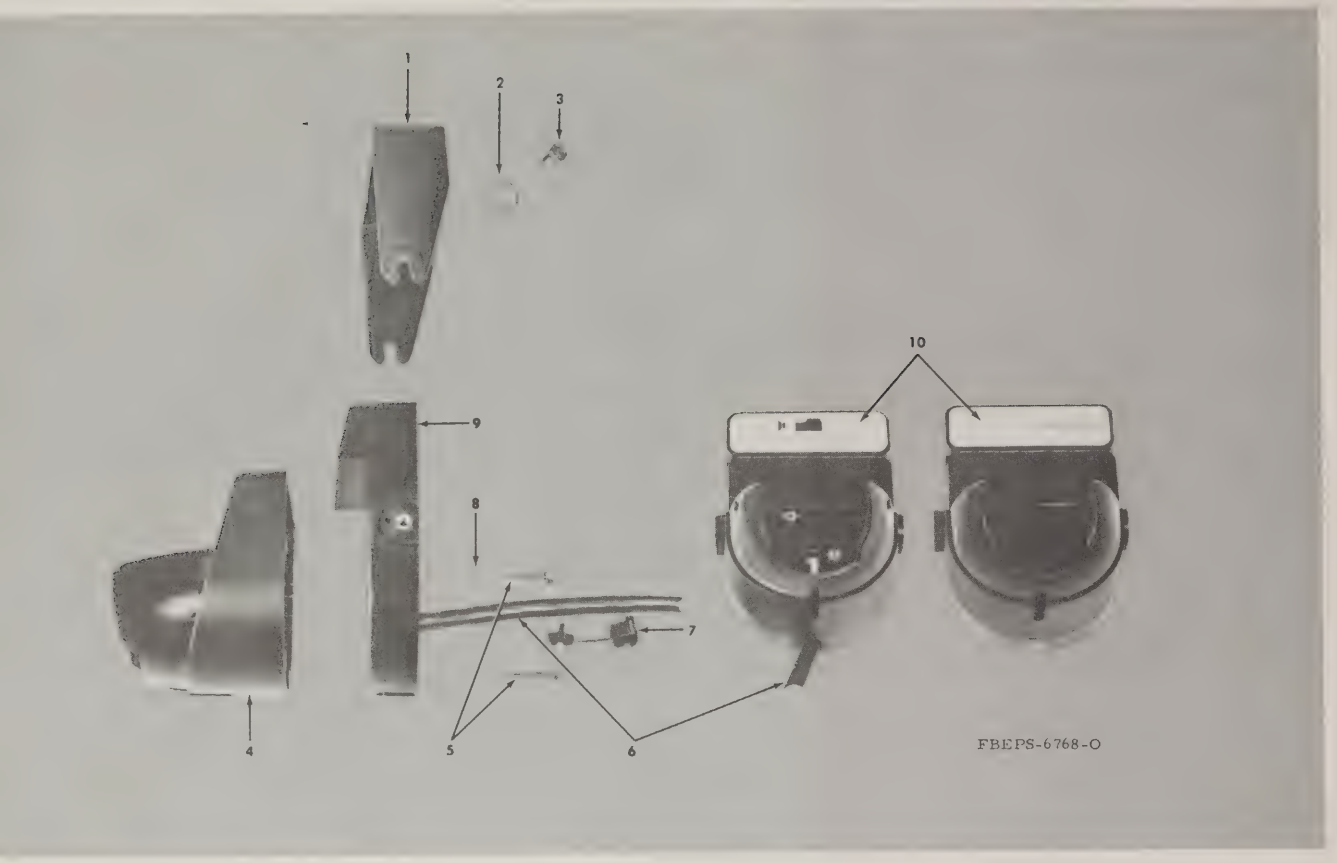
parts list

TLN5730A 2-Code Adapter Board — PL-3414-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode (see note):
CR850 – 867	48-83654H01	silicon
		connector, receptacle:
J850, 851	9-82071K01	female; 12-contact
		connector, plug:
P850		consists of
	28-82070K01	CONTACT, male; 13 req'd
		transistor (see note):
Q850, 851	48-869642	NPN; type M9642
		resistor, fixed:
R850, 852, 853, 856	6-124A73	10k ±5%; ¼ W
R851, 854	6-124A65	4.7k ±5%; ¼ W
		non-referenced items
	1V80769B88	CIRCUIT BOARD ASSY., incl referenced item P850
	3-138804	SCREW, machine (4-40 x 5/16"); 2 req'd

note: For best performance, order diodes and transistors by Motorola part number

DPL TWO-CODE ADAPTER/MITREK ACCESSORIES



ANDSET HANGUP BOX

ndset hangup boxes are used (1) to automatically Private-Line" and "Digital Private-Line" radios nonitor (carrier squelch) mode when the handset l off-hook, and (2) transfer audio from the speaker to the handset receiver when the handset off-hook. Model TLN4698A is used in most in-ons. Model TLN4507A also contains a slide o place the radio in the monitor mode with the still on-hook; this model is used in situations he normal MONITOR switch on the control used for special functions. or when used in con-n with a carrier squelch control head. The 05A Hangup Cup is supplied with carrier squelch

parts list

Hangup Boxes — PL-6063-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	7D80200E01	trunnion bracket
2	4S1724	flat washer (0.234" x 0.625" x .048")
3	3S7302	Phillips hexhead machine screw (10-32 x 3/8")
4	15C84520C01	hangup cup and switch assembly
	or 15C84520C02	hangup cup (TLN4505A)
5	3S135507	Phillips hexhead machine screw (6-32 x 3/4")
6	1V80717B42	cable assembly, includes attached insertable connector contacts (TLN4507A)
	or 1V80727B32	cable assembly, includes attached insertable connector contacts (TLN4698A)
7	42B82018H08	cable strain relief anchor
8	4S1720	flat washer (0.156" x 0.378" x .030")
9	1V80717B40	mounting base and switch assembly (TLN4507A)
	or 58D84514C01	mounting base (TLN4698A and TLN4505A)
10	13B84515C01	escutcheon (TLN4507A)
	or 13B84515C02	escutcheon (TLN4698A and TLN4505A)
	non-coded items	
	42B82018H08	cable retainer (TLN4698A)
	3S136756	tapping screw (20 x 5/8") (TLN4698A)
	38B84383D01	protective cap

parts list

HSN4002A Speaker (with *Systems 90*) — PL-7223-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		speaker
LS301	50-84561B02	diameter 5", PM
	mechanical parts	
	18-0701T24	cable
	18-0705T21	mounting hardware
	3-140001	tapping screw (6-19 x 7/8"), 4 used
	38-4244C01	wing screw, 2 used
	78-4568B01	trunnion bracket
	13-82671M01	speaker bezel
	15-84981B01	speaker base cover
	32-84564B01	speaker gasket

MOTOROLA INC.

Communications Group

instruction manual revision

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct the manual accordingly.

INSTRUCTION MANUALS AFFECTED:

68P81045E65-O	*Mitrek* Two-Way FM Radio; 29.7 – 50 MHz, 60/110 Watts
68P81045E70-O	*Mitrek* Two-Way FM Radio; 136 – 174 MHz, 40/60/75/110 Watts
68P81045E75-A	*Mitrek* Two-Way FM Radio; 406 – 420 MHz and 450 – 412 MHz, 30/50 Watts, 75/100 Watts

REVISION DETAILS:

1. In Instruction Manual **68P81045E65-O**:

   A. Replace present Pages i, ii, iii, and iv with attached Pages i, ii, iii, and iv.

   B. Revise the applicable standard specifications on Page vi by substituting the higher values given in *Table 1* (Page 1) of attached Instruction Manual **68P81046E05-B**.

2. In Instruction Manual **68P81045E70-O**:

   A. Replace present Pages iii and iv with attached Pages iii and iv.

   B. Revise the applicable standard specifications on Page vi by substituting the higher values given in *Table 1* (Page 1) of attached Instruction Manual **68P81046E05-B**.

3. In Instruction Manual **68P81045E75-A**:

   A. Replace the present Pages iii and iv with the attached Pages iii and iv.

   B. Revise the applicable standard specifications on Page vi by substituting the higher values given in *Table 1* (Page 1) of attached Instruction Manual **68P81046E05-B**.

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WMR-0096
2/28/83

"MITREK" ACCESSORIES

MOBILE MICROPHONE

The mobile microphone contains the microphone element and a push-to-talk switch. Model HMN4000B is packaged in a rugged weather-resistant housing; Model HMN4001B uses conventional packaging. Schematic details are shown on the control head schematic diagram in this manual.

parts list

HMN4005A Microphone
HMN4006A Microphone — PLW-0036-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		cable assembly
P102	1-84135C01	includes coil cord
		cartridge
MK321	1-80706T87	ELECTRETBOARD, preamp coated
		switch
S318	40-82263G01	dpst
		mechanical parts
	3-13999	tapping screw (6-32 x ⅜"), 3 used
	3-14000	tapping screw (6-32 x ¾"), 3 used
	3-135084	screw, 2 used
	13-83174B03	microphone front housing
	15-82662M24	microphone gasket
	35-82652K01	microphone baffle
	38-84559B01	microphone button
	'42-852710	strap
	1-80701T27	microphone rear housing, includes hangup button
	33-82599D07	nameplate (HMN4005A, 4006A)
	54-84962K01	safety tag
	15-82896M01	microphone adapter
	29-5355	lug
	37-12706	grommet
	4-136334	flat washer

note: The conformal coating on the electret preamp circuit board must remain undisturbed. The board cannot be repaired.

SPEAKER

The HSN4000A Speaker provides the audio output from the radio. It is equipped with its own trunnion bracket and may be mounted on the firewall or dashboard near the radio. The speaker is mounted in a strong, weather-resistant housing.

parts list

HSN4000A Speaker — PL-6060-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		speaker
LS301	50-84561B02	diameter 5", PM
		mechanical parts
	3-132436	machine screw (6-32 x 13/16"), 4 used
	3-84244C01	trunnion screw, 2 used
	7-80200E02	trunnion bracket
	13-84151C02	speaker bezel
	15-84981B09	speaker base cover
	32-80195A01	speaker gasket
	38-84383D02	protective cap, 3 used
	29-82602D01	terminal pin, 2 used
	37-82603D31	sleeving, coded 31
	37-82603D32	sleeving, coded 32
	42-82018H05	cable retainer
	42-84081A03	wire clamp
	3-136756	tapping screw (10-16 x ⅝"), 3 used
	30-83155H01	2-conductor cable

MICROPHONE HANGUP BOX

The microphone hangup boxes are used with "Private-Line" and "Digital Private-Line" radios to automatically place the radios in the monitor (carrier-squelch) mode when the microphone is lifted off-hook. Model HLN4024A is used in most installations. Model HLN4025A also contains a slide switch to place the radio in the monitor mode with the microphone still on-hook; this model is used in situations where the normal MONITOR switch on the control head is used for special functions or when used in conjunction with a carrier squelch control head.

parts list

HLN4024A Microphone Hangup Box
HLN4025A Microphone Hangup Box with Switch — PL-6061-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		switch
S101	40-82159D02	spst
	or 40-84198C02	open leaf (HLN4025A)
S301	40-84622B04	spst, slide (HLN4025A)
		mechanical parts
	3-139913	tapping screw (8-15 x ½"), 2 used
	3-129075	machine screw (2-56 x ½"), 2 used (HLN4024A)
	4-8406	#2 internal lockwasher, 2 used
	7-80268A01	switch bracket (HLN4024A)
	14-80266A01	insulator (HLN4024A)
	32-05719B01	switch boot (HLN4024A)
	38-84383D01	protective cap, 2 used
	42-82018H07	cable retainer
	15-80191A01	hangup box housing
	4-400136	flat washer (.196 x .312 x .067")
	41-867668	spring
	29-82602D01	terminal pin, 2 used
	37-80143B01	coded 24/30 sleeving
	37-82603D27	coded 27 sleeving
	3-135495	tapping screw (2-56 x ⅜"), 2 used (HLN4025A)
	64-84199C01	mounting plate (HLN4025A)
	15-84626B02	hangup box housing (HLN4025A)
	2-7041	nut (2-56 x 3/16"), 2 used (HLN4024A)
	64-80240E01	pressure plate switch

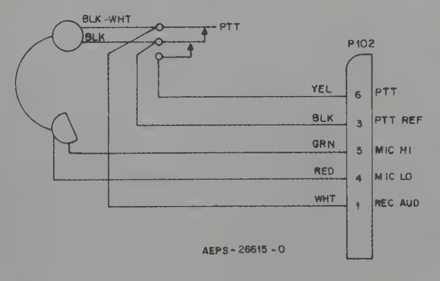
IGNITION SENSE LEAD

The optional ignition sense lead is used in systems where the green lead is connected to the battery (allowing receiver operation at all times) and it is desired to allow transmitter operation *only* when the ignition switch is on. This option includes the orange power lead and fuse; this lead supplies power to the radio PTT circuits when an optional jumper is altered in dc control head.

parts list

HKN4007A Ignition Switch Cable — PL-6058-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F401	65-890033	1-1/2 amp; 250 V
		fuseholder:
		includes:
	14-82882A01	INSULATOR, fuse, body
	14-82883A01	INSULATOR, fuse, cap
	41-82885A01	SPRING
	42-82884A01	CLIP, fuse; 2 used
		cable, power, orange, includes:
	30-10310A62	WIRE, .18 ga. stranded, orange, 66-1/2"
	37-82603D20	SLEEVING, coded #20
	29-82602D01	PIN TERMINAL
	29-136968	LUG, soldering
	29-824456	LUG, ring tongue
	29-865065	LUG, ring tongue



HANDSET

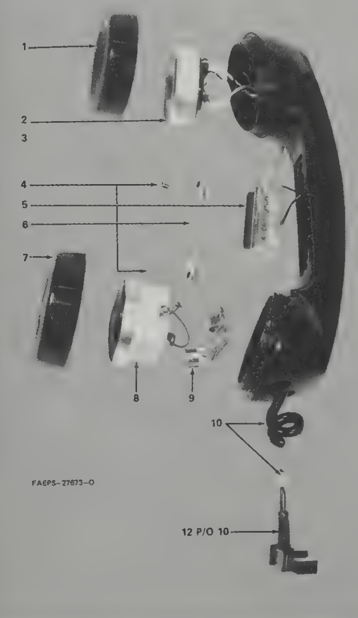
The TMN6057A Handset is used in installations where a telephone-style handset is preferred to the mobile microphone and speaker. The unit operates in the same manner as a telephone handset except that it has a PTT button which is used to key the radio.

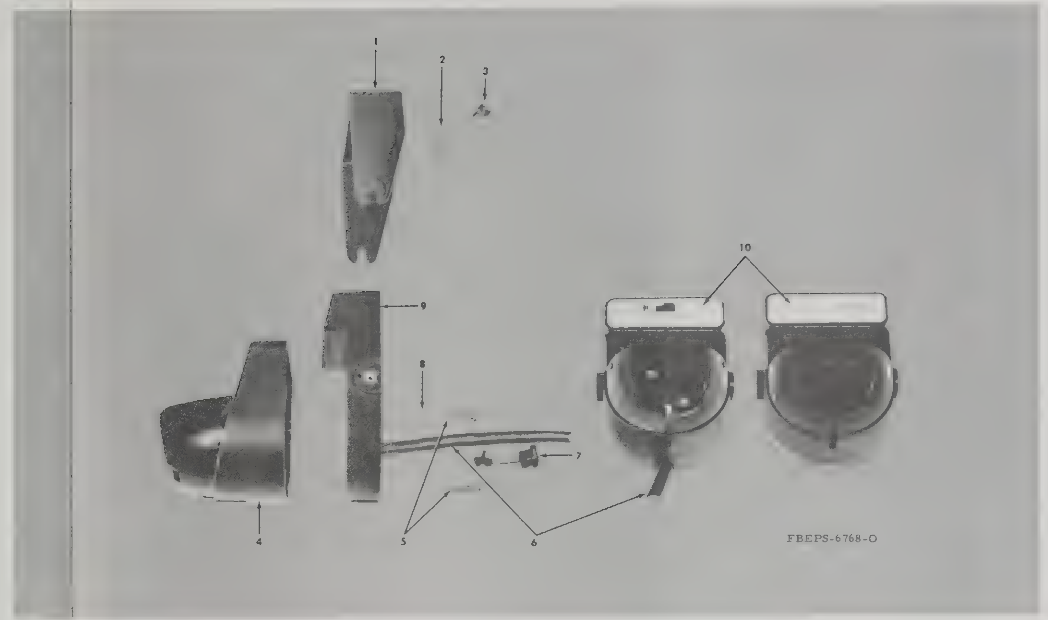
parts list

TMN6057A HANDSET — PL-6064-A

CODE	MOTOROLA PART NO.	DESCRIPTION
1	15B84054A01	CAP, receiver (see note)
2	59C84058A01	CARTRIDGE, receiver
3	15C84059A01	HANDLE (see note)
4	3S124432	SCREW, machine: 4-40 x 1/4" "Phillips" flat head; 2 req'd.
5	40C84087A01	SWITCH, push; includes pushbutton and dust cover
6	15B84053A01	PLATE, switch cover
7	15B84055A01	CAP, transmitter (see note)
8	59B83272G01	MICROPHONE ELEMENT, telephone; dynamic type
9	7B83352H01	BRACKET, cord retaining
10	1D84519C01	CORD ASSEMBLY; includes a "molded-on" 5-contact female connector
12		CONNECTOR, plug: 5-contact; "molded-on"

note: A replacement handle, plus transmit and receiver caps, can be obtained by ordering Part No. 15C84107A01.





HANDSET HANGUP BOX

The handset hangup boxes are used (1) to automatically place "Private-Line" and "Digital Private-Line" radios in the monitor (carrier squelch) mode when the handset is lifted off-hook, and (2) transfer audio from the mobile speaker to the handset receiver when the handset is lifted off-hook. Model TLN4698A is used in most installations. Model TLN4507A also contains a slide switch to place the radio in the monitor mode with the handset still on-hook; this model is used in situations where the normal MONITOR switch on the control head is used for special functions. or when used in conjunction with a carrier squelch control head. The TLN4505A Hangup Cup is supplied with carrier squelch models.

parts list

Hangup Boxes — PL-6063-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	7D80200E01	trunnion bracket
2	4S1724	flat washer (0.234" x 0.625" x .048")
3	3S7302	Phillips hexhead machine screw (10-32 x ⅜"
4	15C84520C01	hangup cup and switch assembly
	or 15C84520C02	hangup cup (TLN4505A)
5	3S135507	Phillips hexhead machine screw (6-32 x [illegible]
6	1V80717B42	cable assembly, includes attached insertable connector contacts (TLN4507A)
	or 1V80727B32	cable assembly, includes attached insertable connector contacts (TLN4698A)
7	42B82018H08	cable strain relief anchor
8	4S1720	flat washer (0.156" x 0.378" x .030")
9	1V80717B40	mounting base and switch assembly (TLN4507A)
	or 58D84514C01	mounting base (TLN4698A and TLN4505A)
10	13B84515C01	escutcheon (TLN4507A)
	or 13B84515C02	escutcheon (TLN4698A and TLN4505A)
		non-coded items
	42B82018H08	cable retainer (TLN4698A)
	3S136756	tapping screw (20 x ⅝") (TLN4698A)
	38B84383D01	protective cap

parts list

HSN4002A Speaker (with *Systems 90*) — PL-7223-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		speaker
LS301	50-84561B02	diameter 5", PM
		mechanical parts
	18-0701T24	cable
	18-0705T21	mounting hardware
	3-140001	tapping screw (6-19 x ⅞"), 4 used
	38-4244C01	wing screw, 2 used
	78-4568B01	trunnion bracket
	13-82671M01	speaker bezel
	15-84981B01	speaker base cover
	32-84564B01	speaker gasket

MOTOROLA INC.

Communications Group

instruction manual revision

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct the manual accordingly.

INSTRUCTION MANUALS AFFECTED:

68P81045E65-O	*Mitrek* Two-Way FM Radio; 29.7 – 50 MHz, 60/110 Watts
68P81045E70-O	*Mitrek* Two-Way FM Radio; 136 – 174 MHz, 40/60/75/110 Watts
68P81045E75-A	*Mitrek* Two-Way FM Radio; 406 – 420 MHz and 450 – 412 MHz, 30/50 Watts, 75/100 Watts

REVISION DETAILS:

1. In Instruction Manual **68P81045E65-O**:

   A. Replace present Pages i, ii, iii, and iv with attached Pages i, ii, iii, and iv.

   B. Revise the applicable standard specifications on Page vi by substituting the higher values given in *Table 1* (Page 1) of attached Instruction Manual **68P81046E05-B**.

2. In Instruction Manual **68P81045E70-O**:

   A. Replace present Pages iii and iv with attached Pages iii and iv.

   B. Revise the applicable standard specifications on Page vi by substituting the higher values given in *Table 1* (Page 1) of attached Instruction Manual **68P81046E05-B**.

3. In Instruction Manual **68P81045E75-A**:

   A. Replace the present Pages iii and iv with the attached Pages iii and iv.

   B. Revise the applicable standard specifications on Page vi by substituting the higher values given in *Table 1* (Page 1) of attached Instruction Manual **68P81046E05-B**.

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2/28/83

MOTOROLA INC.
Communications Group

MITREK TWO-WAY FM RADIO

29.7-50 MHz
60/110 Watts

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68P81045E65-O

MODEL CHART
FOR
MITREK MOBILE RADIO
1 – 4 FREQUENCY
60 AND 110 WATT RF POWER
29.7 – 50 MHz

CODE:

- ● = ONE ITEM SUPPLIED
- / = ONE ITEM SUPPLIED DEPENDENT ON FREQUENCY RANGE
- 4 = NUMBER INDICATES QUANTITY SUPPLIED
- ★ = INDICATES BREAKDOWN ON SEPARATE CHART

MODEL	DESCRIPTION
	CARRIER SQUELCH
T51JJA1000CK	RADIO SET, 60-WATT, 1-FREQUENCY
T51JJA1900CK	RADIO SET, 60-WATT, 4-FREQUENCY
T51JJA2000CK	RADIO SET WITH EXTENDER, 60-WATT, 1-FREQUENCY
T51JJA2900CK	RADIO SET WITH EXTENDER, 60-WATT, 4-FREQUENCY
	PRIVATE-LINE
T51JJA3000DK	RADIO SET, 60-WATT, 1-FREQUENCY
T51JJA3900DK	RADIO SET, 60-WATT, 4-FREQUENCY
T51JJA4000DK	RADIO SET WITH EXTENDER, 60-WATT, 1-FREQUENCY
T51JJA4900DK	RADIO SET WITH EXTENDER, 60-WATT, 4-FREQUENCY
	DIGITAL *PRIVATE-LINE*
T51JJA6000CK	RADIO SET, 60-WATT, 1-FREQUENCY
T51JJA6900CK	RADIO SET, 60-WATT, 4-FREQUENCY
T51JJA8000CK	RADIO SET WITH EXTENDER, 00-WATT, 1-FREQUENCY
T51JJA8900CK	RADIO SET WITH EXTENDER, 00 WATT, 4-FREQUENCY
	CARRIER SQUELCH
T81JJA1000CK	RADIO SET, 110-WATT, 1-FREQUENCY
T81JJA1900CK	RADIO SET, 110-WATT, 4-FREQUENCY
T81JJA2000CK	RADIO SET WITH EXTENDER, 110-WATT, 1-FREQUENCY
T81JJA2900CK	RADIO SET WITH EXTENDER, 110-WATT, 4-FREQUENCY
	PRIVATE-LINE
T81JJA3000DK	RADIO SET, 110-WATT, 1-FREQUENCY
T81JJA3900DK	RADIO SET, 110-WATT, 4-FREQUENCY
T81JJA4000DK	RADIO SET WITH EXTENDER, 110-WATT, 1-FREQUENCY
T81JJA4900DK	RADIO SET WITH EXTENDER, 110-WATT, 4-FREQUENCY
	DIGITAL *PRIVATE-LINE*
T81JJA6000CK	RADIO SET, 110-WATT, 1-FREQUENCY
T81JJA6900CK	RADIO SET, 110-WATT, 4-FREQUENCY
T81JJA8000CK	RADIO SET WITH EXTENDER, 110-WATT, 1-FREQUENCY
T81JJA8900CK	RADIO SET WITH EXTENDER, 110-WATT, 4-FREQUENCY

ITEM	DESCRIPTION
★ HUB1043C	CHASSIS NON-EXTENDER (29.7 – 38.999 MHz) 60-WATT
★ HUB1044C	CHASSIS NON-EXTENDER (39 – 50 MHz) 60-WATT
★ HUB1063C	CHASSIS WITH EXTENDER (29.7 – 38.999 MHz) 60-WATT
★ HUB1064C	CHASSIS WITH EXTENDER (39 – 50 MHz) 60-WATT
★ HUB1053C	CHASSIS NON-EXTENDER (29.7 – 38.999 MHz) 110-WATT
★ HUB1054C	CHASSIS NON-EXTENDER (39 – 50 MHz) 110-WATT
★ HUB1073C	CHASSIS WITH EXTENDER (29.7 – 38.999 MHz) 110-WATT
★ HUB1074C	CHASSIS WITH EXTENDER (39 – 50 MHz) 110-WATT
HLN4181A	SOLID STATE *PRIVATE-LINE* ENCODER/DECODER
HLN4011A	DIGITAL *PRIVATE-LINE* ENCODER/DECODER
TRN4224A	CODE PLUG
TRN5005A	CODE PLUG
KKN1085A	CHANNEL ELEMENT, RECEIVER
KKN1087A	CHANNEL ELEMENT, TRANSMITTER
HLN4000A	HOUSING, TOP COVER, LOW-POWER
HLN4001A	HOUSING, TOP COVER, HIGH-POWER
HLN4034A	HOUSING, BOTTOM COVER
HCN4000A	CONTROL HEAD (1-FREQUENCY) CARRIER SQUELCH
HCN4001A	CONTROL HEAD (4-FREQUENCY) CARRIER SQUELCH
HCN4002A	CONTROL HEAD (1-FREQUENCY) *PRIVATE-LINE*
HCN4003A	CONTROL HEAD (4-FREQUENCY) *PRIVATE-LINE*
HMN4000A	MICROPHONE
HSN4009A	SPEAKER
HKN4000A	CABLE (17') 1-FREQUENCY
HKN4001A	CABLE (17') 4-FREQUENCY
HKN4016A	CABLE (17') 1-FREQUENCY
HKN4017A	CABLE (17') 4-FREQUENCY
HLN4024A	MICROPHONE HANGUP BOX
TAB1001C	ANTENNA (25 – 30 MHz)
TAB1002C	ANTENNA (30 – 54 MHz)
HLN4022A	INSTALLATION KIT
HLN4023A	TUNING TOOL KIT
HKN4041A	FUSED LEAD

EPW-0111-A

MODEL CHART
FOR
UNIFIED CHASSIS
MITREK MOBILE RADIO
29.7 – 50 MHz
60 AND 110 WATTS
RF POWER

CODE:

- ● = ONE ITEM SUPPLIED
- ■ = SEE FURTHER BREAKDOWN IN THIS CHART
- ★ = SEE FURTHER BREAKDOWN IN SEPARATE CHART

MODEL	DESCRIPTION	HUB1043C	HUB1044C	HUB1053C	HUB1054C	HUB1063C	HUB1064C	HUB1073C	HUB1074C	HUB1041C	HUB1042C	HUB1051C	HUB1052C	HUB1061C	HUB1062C	HUB1071C	HUB1072C
■ HUB1043C	UNIFIED CHASSIS 29.70 – 38.999 MHz (60-WATT) R1																
■ HUB1044C	UNIFIED CHASSIS 39.00 – 50.00 MHz (60-WATT) R2																
■ HUB1053C	UNIFIED CHASSIS 29.70 – 38.999 MHz (110-WATT) R1																
■ HUB1054C	UNIFIED CHASSIS 39.00 – 50.00 MHz (110-WATT) R2																
■ HUB1063C	UNIFIED CHASSIS WITH EXTENDER 29.70 – 38.999 MHz (60-WATT) R1																
■ HUB1064C	UNIFIED CHASSIS WITH EXTENDER 39.00 – 50.00 MHz (60-WATT) R2																
■ HUB1073C	UNIFIED CHASSIS WITH EXTENDER 29.70 – 38.999 MHz (110-WATT) R1																
■ HUB1074C	UNIFIED CHASSIS WITH EXTENDER 39.00 – 50.00 MHz (110-WATT) R2																
HUB1041C	UNIFIED CHASSIS NON-EXTENDER (60-WATT) R1																
HUB1042C	UNIFIED CHASSIS NON-EXTENDER (60-WATT) R2																
HUB1051C	UNIFIED CHASSIS NON-EXTENDER (110-WATT) R1																
HUB1052C	UNIFIED CHASSIS NON-EXTENDER (110-WATT) R2																
HUB1061C	UNIFIED CHASSIS WITH EXTENDER (60-WATT) R1																
HUB1062C	UNIFIED CHASSIS WITH EXTENDER (60-WATT) R2																
HUB1071C	UNIFIED CHASSIS WITH EXTENDER (110-WATT) R1																
HUB1072C	UNIFIED CHASSIS WITH EXTENDER (110-WATT) R2																
HLN4189B	HARDWARE KIT, LOW-BAND	●	●	●	●	●	●	●	●								
★ HLB1001A	POWER AMPLIFIER (60-WATT) R1									●				●			
★ HLB1002A	POWER AMPLIFIER (60-WATT) R2										●				●		
★ HLB1011B	POWER AMPLIFIER (110-WATT) R1											●				●	
★ HLB1012B	POWER AMPLIFIER (110-WATT) R2												●				●
HLB4011B	MAIN BOARD NON-EXTENDER R1									●		●					
HLB4012B	MAIN BOARD NON-EXTENDER R2										●		●				
HLB4001B	MAIN BOARD WITH EXTENDER R1													●		●	
HLB4002B	MAIN BOARD WITH EXTENDER R2														●		●
HLN4193A	HARDWARE KIT									●	●			●	●		
HLN4200A	HARDWARE KIT, HIGH-POWER											●	●			●	●
HLN4047A	HARDWARE WIRING KIT, HIGH-POWER											●	●			●	●
HLN4019A	HARDWARE WIRING KIT									●	●			●	●		
HLN4033A	INNER BOTTOM COVER AND GASKET									●	●	●	●	●	●	●	●
HLN4192B	INTERCONNECT BOARD									●	●	●	●	●	●	●	●

EPS-30272-A

MODEL CHART
FOR
MITREK MOBILE RADIO
146 – 174 MHz
1 – 4 FREQUENCY
40/60/75/110-WATT RF POWER

CODE:

- ● = ONE ITEM SUPPLIED
- / = ONE ITEM SUPPLIED DEPENDENT UPON FREQUENCY RANG
- 4 = NUMBER INDICATES QUANTITY SUPPLIED
- ■ = INDICATES BREAKDOWN ON SEPARATE CHART

MODEL	DESCRIPTION
	CARRIER SQUELCH
T43JJA1000CK	RADIO SET, 40-WATT; 1-FREQUENCY
T43JJA1900CK	RADIO SET, 40-WATT; 4-FREQUENCY
T53JJA1000CK	RADIO SET, 60-WATT; 1-FREQUENCY
T53JJA1900CK	RADIO SET, 60-WATT; 4-FREQUENCY
T63JJA1000CK	RADIO SET, 75-WATT; 1-FREQUENCY
T63JJA1900CK	RADIO SET, 75-WATT; 4-FREQUENCY
T83JJA1000CK	RADIO SET, 110-WATT; 1-FREQUENCY
T83JJA1900CK	RADIO SET, 110-WATT; 4-FREQUENCY
	PRIVATE-LINE
T43JJA3000DK	RADIO SET, 40-WATT; 1-FREQUENCY
T43JJA3900DK	RADIO SET, 40-WATT; 4-FREQUENCY
T53JJA3000DK	RADIO SET, 60-WATT; 1-FREQUENCY
T53JJA3900DK	RADIO SET, 60-WATT; 4-FREQUENCY
T63JJA3000DK	RADIO SET, 75-WATT; 1-FREQUENCY
T63JJA3900DK	RADIO SET, 75-WATT; 4-FREQUENCY
T83JJA3000DK	RADIO SET, 110-WATT; 1-FREQUENCY
T83JJA3900DK	RADIO SET, 110-WATT; 4-FREQUENCY
	DIGITAL PRIVATE-LINE
T43JJA6000CK	RADIO SET, 40-WATT; 1-FREQUENCY
T43JJA6900CK	RADIO SET, 40-WATT; 4-FREQUENCY
T53JJA6000CK	RADIO SET, 60-WATT; 1-FREQUENCY
T53JJA6900CK	RADIO SET, 60-WATT; 4-FREQUENCY
T63JJA6000CK	RADIO SET, 75-WATT; 1-FREQUENCY
T63JJA6900CK	RADIO SET, 75-WATT; 4-FREQUENCY
T83JJA6000CK	RADIO SET, 110-WATT; 1-FREQUENCY
T83JJA6900CK	RADIO SET, 110-WATT; 4-FREQUENCY

ITEM	DESCRIPTION
■ HUD1053C	CHASSIS, 136 – 146 MHz (40-WATT)
■ HUD1054C	CHASSIS, 146 – 174 MHz (40-WATT)
■ HUD1063C	CHASSIS, 136 – 146 MHz (60-WATT)
■ HUD1064C	CHASSIS, 146 – 174 MHz (60-WATT)
■ HUD1082C	CHASSIS, 136 – 146 MHz (75/110-WATT)
■ HUD1074C	CHASSIS, 146 – 174 MHz (75/110-WATT)
HLN4181A	*PRIVATE-LINE* BOARD
HLN4011A	*DIGITAL PRIVATE-LINE* BOARD
TRN6005A	CODE PLUG
TRN4224A	CODE PLUG
KXN1086B	CHANNEL ELEMENT, RECEIVER
KXN1088A	CHANNEL ELEMENT, TRANSMITTER
HHN4000A	HOUSING, TOP COVER, LOW-POWER
HHN4001A	HOUSING, TOP COVER, HIGH-POWER
HLN4034A	HOUSING, BOTTOM COVER
HCN4000A	CONTROL HEAD, 1-FREQUENCY, CARRIER SQUELCH
HCN4001A	CONTROL HEAD, 4-FREQUENCY, CARRIER SQUELCH
HCN4002A	CONTROL HEAD, 1-FREQUENCY, *PRIVATE-LINE*
HCN4003A	CONTROL HEAD, 4-FREQUENCY, *PRIVATE-LINE*
HMN4000A	MICROPHONE
HSN4009A	SPEAKER
HKN4000A	CABLE (17") 1-FREQUENCY
HKN4001A	CABLE (17") 4-FREQUENCY
HKN4016A	CABLE (17") 1-FREQUENCY
HKN4017A	CABLE (17") 4-FREQUENCY
HLN4024A	MICROPHONE HANGUP BOX
TAD6111A	ANTENNA, ROOFTOP (136 – 144 MHz)
TAD6112A	ANTENNA, ROOFTOP (144 – 152 MHz)
TAD6113A	ANTENNA, ROOFTOP (152 – 162 MHz)
TAD6014A	ANTENNA, ROOFTOP (162 – 174 MHz)
HLN4022A	INSTALLATION KIT
HLN4023A	TUNING TOOL KIT
HKN4041A	FUSE LEAD

EPS-27385-C

MODEL CHART
FOR
MITREK MOBILE RADIO
136 – 174 MHz
40/60/75/110 WATTS
RF POWER

CODE:

- ● = ONE ITEM SUPPLIED
- ■ = SEE FURTHER BREAKDOWN IN THIS CHART
- ★ = SEE FURTHER BREAKDOWN IN SEPARATE CHART

MODEL	DESCRIPTION
■ HUD1053C	UNIFIED CHASSIS, 136 – 146 MHz (40-WATT) R1
■ HUD1054C	UNIFIED CHASSIS, 146 – 174 MHz (40-WATT) R2
■ HUD1063C	UNIFIED CHASSIS (60-WATT) R1
■ HUD1064C	UNIFIED CHASSIS (60-WATT) R2
■ HUD1082C	UNIFIED CHASSIS (110-WATT) R1
■ HUD1074C	UNIFIED CHASSIS (110-WATT) R2
HUD1051C	UNIFIED SUB CHASSIS
HUD1052C	UNIFIED SUB CHASSIS
HUD1061C	UNIFIED SUB CHASSIS
HUD1062C	UNIFIED SUB CHASSIS
HUD1081C	UNIFIED SUB CHASSIS
HUD1072C	UNIFIED SUB CHASSIS

	ITEM	DESCRIPTION	1053C	1054C	1063C	1064C	1082C	1074C	1051C	1052C	1061C	1062C	1081C	1072C
■	HUD1051C	UNIFIED CHASSIS, VHF R1 (40-WATT)	●											
■	HUD1052C	UNIFIED CHASSIS, VHF R2 (40-WATT)		●										
■	HUD1061C	UNIFIED CHASSIS, VHF R1 (60-WATT)			●									
■	HUD1062C	UNIFIED CHASSIS, VHF R2 (60-WATT)				●								
■	HUD1081C	UNIFIED CHASSIS, VHF R1 (110-WATT)					●							
■	HUD1072C	UNIFIED CHASSIS, VHF R2 (110-WATT)						●						
	HLN4189A	HARDWARE KIT, 136 – 174 MHz	●	●	●	●	●	●						
★	HLD1001A	POWER AMPLIFIER, R1 (40-WATT)							●					
★	HLD1002B	POWER AMPLIFIER, R2 (40-WATT)								●				
★	HLD1011A	POWER AMPLIFIER, R1 (60-WATT)									●			
★	HLD1012A	POWER AMPLIFIER, R2 (60-WATT)										●		
★	HLD1031A	POWER AMPLIFIER, R1 (110-WATT)											●	
★	HLD1032A	POWER AMPLIFIER, R2 (110-WATT)												●
	HLD4081B	MAIN BOARD, R1							●		●		●	
	HLD4082B	MAIN BOARD, R2								●		●		●
	HLN4194A	HARDWARE KIT							●	●	●	●		
	HLN4019A	HARDWARE WIRING KIT							●	●	●	●		
	HLN4199A	HARDWARE KIT, HIGH-POWER											●	●
	HLN4047A	HARDWARE WIRING KIT, HIGH-POWER											●	●
	HLN4033A	INNER BOTTOM COVER AND GASKET							●	●	●	●	●	●
	HLN4192B	INTERCONNECT BOARD							●	●	●	●	●	●

EPS-29766-A

MODEL CHART
FOR
UHF *MITREK* MOBILE RADIO
(406 – 420 MHz) 30/50/100 W
(450 – 470 MHz) 30/50/75/100 W
(470 – 512 MHz) 19/39/59/75 W
(50/100/150/200 W ERP)

CODE:

- ● = ONE ITEM SUPPLIED
- / = ONE ITEM SUPPLIED DEPENDENT UPON FREQUENCY RANGE
- 4 = QUANTITY SUPPLIED
- ■ = BREAKDOWN ON SEPARATE CHART

MODEL / DESCRIPTION	T34JJA1000CK	T34JJA1900CK	T34JJA3000DK	T34JJA3900DK	T34JJA6000CK	T34JJA6900CK	T44JJA1000CK	T44JJA1900CK	T44JJA3000DK	T44JJA3900DK	T44JJA6000CK	T44JJA6900CK	T64JJA1000CK	T64JJA1900CK	T64JJA3000DK	T64JJA3900DK	T64JJA6000CK	T64JJA6900CK	T74JJA1000CK	T74JJA1900CK	T74JJA3000DK	T74JJA3900DK	T74JJA6000CK	T74JJA6900CK
30-WATT MODELS																								
1-FREQUENCY CARRIER SQUELCH	/	/	/	/	/	/																		
4-FREQUENCY CARRIER SQUELCH	/	/	/	/	/	/																		
1-FREQUENCY *PRIVATE-LINE*	/	/	/	/	/	/																		
4-FREQUENCY *PRIVATE-LINE*	/	/	/	/	/	/																		
1-FREQUENCY *DIGITAL PRIVATE-LINE*	/	/	/	/	/	/																		
4-FREQUENCY *DIGITAL PRIVATE-LINE*	/	/	/	/	/	/																		
50-WATT MODELS																								
1-FREQUENCY CARRIER SQUELCH							/	/	/	/	/	/												
4-FREQUENCY CARRIER SQUELCH							/	/	/	/	/	/												
1-FREQUENCY *PRIVATE-LINE*							/	/	/	/	/	/												
4-FREQUENCY *PRIVATE-LINE*							/	/	/	/	/	/												
1-FREQUENCY *DIGITAL PRIVATE-LINE*							/	/	/	/	/	/												
4-FREQUENCY *DIGITAL PRIVATE-LINE*							/	/	/	/	/	/												
75-WATT MODELS																								
1-FREQUENCY CARRIER SQUELCH													/	/	/	/	/	/	/	/	/	/	/	/
4-FREQUENCY CARRIER SQUELCH													/	/	/	/	/	/	/	/	/	/	/	/
1-FREQUENCY *PRIVATE-LINE*													/	/	/	/	/	/	/	/	/	/	/	/
4-FREQUENCY *PRIVATE-LINE*													/	/	/	/	/	/	/	/	/	/	/	/
1-FREQUENCY *DIGITAL PRIVATE-LINE*													/	/	/	/	/	/	/	/	/	/	/	/
4-FREQUENCY *DIGITAL PRIVATE-LINE*													/	/	/	/	/	/	/	/	/	/	/	/
100-WATT MODELS																								
1-FREQUENCY CARRIER SQUELCH																			/	/	/	/	/	/
4-FREQUENCY CARRIER SQUELCH																			/	/	/	/	/	/
1-FREQUENCY *PRIVATE-LINE*																			/	/	/	/	/	/
4-FREQUENCY *PRIVATE-LINE*																			/	/	/	/	/	/
1-FREQUENCY *DIGITAL PRIVATE-LINE*																			/	/	/	/	/	/
4-FREQUENCY *DIGITAL PRIVATE-LINE*																			/	/	/	/	/	/
HLN4181B *PRIVATE-LINE* BOARD			●	●					●	●					●	●					●	●		
HLN4011A *DIGITAL PRIVATE-LINE* BOARD					●	●					●	●					●	●					●	●
TRN4224A CODE PLUG			●	●					●	●					●	●					●	●		
TRN6005A CODE PLUG					●	●					●	●					●	●					●	●
KXN1086B CHANNEL ELEMENT RECEIVER	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4
KXN1088A CHANNEL ELEMENT TRANSMITTER	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4	●	4
HHN4000A HOUSING, TOP COVER, LOW-POWER	●	●	●	●	●	●	●	●	●	●	●	●												
HHN4001A HOUSING, TOP COVER, HIGH-POWER													●	●	●	●	●	●	●	●	●	●	●	●
HLN4034A HOUSING, BOTTOM COVER	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
HCN4000A CONTROL HEAD (1-FREQUENCY), CARRIER SQUELCH	●						●						●						●					
HCN4001A CONTROL HEAD (4-FREQUENCY), CARRIER SQUELCH		●						●						●						●				
HCN4002A CONTROL HEAD (1-FREQUENCY), *PRIVATE-LINE*			●		●				●		●				●		●				●		●	
HCN4003A CONTROL HEAD (4-FREQUENCY), *PRIVATE-LINE*				●		●				●		●				●		●				●		●
HMN4000B MICROPHONE	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
HSN4009A SPEAKER	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
HKN4000A CONTROL CABLE (17-FT), 1-FREQUENCY	●		●		●		●		●		●													
HKN4001A CONTROL CABLE (17-FT), 4-FREQUENCY		●		●		●		●		●		●												
HKN4016A CONTROL CABLE (17-FT), 1-FREQUENCY, HIGH-POWER													●		●		●		●		●		●	
HKN4017A CONTROL CABLE (17-FT), 4-FREQUENCY, HIGH-POWER														●		●		●		●		●		●
HKN4041A CABLE, FUSE AND RED LEAD, HIGH-POWER													●	●	●	●	●	●	●	●	●	●	●	●
HLN4024A MICROPHONE HANGUP BOX			●	●	●	●			●	●	●	●			●	●	●	●			●	●	●	●
TAE6061B ANTENNA (406 – 430 MHz)	/	/	/	/	/	/																		
TAE6062B ANTENNA (450 – 470 MHz)	/	/	/	/	/	/																		
TAE6094B ANTENNA (470 – 494 MHz)	/	/	/	/	/	/																		
TAE6095B ANTENNA (494 – 512 MHz)	/	/	/	/	/	/																		
HLN4022A INSTALLATION KIT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
HLN4023A TUNING TOOL KIT	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

ITEM	DESCRIPTION
■ HUE1073C	UNIFIED CHASSIS, 30-WATT (406 – 420 MHz)
■ HUE1074C	UNIFIED CHASSIS, 30-WATT (450 – 470 MHz)
■ HUE1157B	UNIFIED CHASSIS, 30-WATT (470 – 512 MHz)
■ HUE1083C	UNIFIED CHASSIS, 50-WATT (406 – 420 MHz)
■ HUE1084C	UNIFIED CHASSIS, 50-WATT (450 – 470 MHz)
■ HUE1161C	UNIFIED CHASSIS, 50-WATT (470 – 512 MHz)
■ HUE1116C	UNIFIED CHASSIS, 100/75-WATT (406 – 420 MHz)
■ HUE1094C	UNIFIED CHASSIS, 100/75-WATT (450 – 470 MHz)
■ HUE1095C	UNIFIED CHASSIS, 100/75-WATT (470 – 494 MHz)
■ HUE1156B	UNIFIED CHASSIS, 100/75-WATT (494 – 512 MHz)

EPW-0031-B

MODEL CHART
FOR
UNIFIED CHASSIS
MITREK TWO-WAY FM RADIO
406 – 420 MHz
450 – 470 MHz
470 – 512 MHz
30/50/75/100 WATTS

CODE:

● = ONE ITEM SUPPLIED

■ = BREAKDOWN ON SEPARATE CHART

MODEL	DESCRIPTION
HUE1073C	UNIFIED CHASSIS, 30-WATT (406 – 420 MHz)
HUE1074C	UNIFIED CHASSIS, 30-WATT (450 – 470 MHz)
HUE1157B	UNIFIED CHASSIS, 30-WATT (470 – 512 MHz)
HUE1083C	UNIFIED CHASSIS, 50-WATT (406 – 420 MHz)
HUE1084C	UNIFIED CHASSIS, 50-WATT (450 – 470 MHz)
HUE1161C	UNIFIED CHASSIS, 50-WATT (470 – 512 MHz)
HUE1116C	UNIFIED CHASSIS, 75/100-WATT (406 – 420 MHz)
HUE1094C	UNIFIED CHASSIS, 75/100-WATT (450 – 470 MHz)
HUE1095C	UNIFIED CHASSIS, 75/100-WATT (470 – 494 MHz)
HUE1156B	UNIFIED CHASSIS, 75/100-WATT (494 – 512 MHz)
HUE1071C	UNIFIED CHASSIS, 30-WATT (406 – 420 MHz)
HUE1072C	UNIFIED CHASSIS, 30-WATT (450 – 470 MHz)
HUE1159B	UNIFIED CHASSIS, 30-WATT (470 – 512 MHz)
HUE1081C	UNIFIED CHASSIS, 50-WATT (406 – 420 MHz)
HUE1082C	UNIFIED CHASSIS, 50-WATT (450 – 470 MHz)
HUE1163B	UNIFIED CHASSIS, 50-WATT (470 – 512 MHz)
HUE1118C	UNIFIED CHASSIS, 75/100-WATT (406 – 420 MHz)
HUE1092C	UNIFIED CHASSIS, 75/100-WATT (450 – 470 MHz)
HUE1093C	UNIFIED CHASSIS, 75/100-WATT (470 – 494 MHz)
HUE1158B	UNIFIED CHASSIS, 75/100-WATT (494 – 512 MHz)

ITEM	DESCRIPTION	HUE1073C	HUE1074C	HUE1157B	HUE1083C	HUE1084C	HUE1161C	HUE1116C	HUE1094C	HUE1095C	HUE1156B	HUE1071C	HUE1072C	HUE1159B	HUE1081C	HUE1082C	HUE1163B	HUE1118C	HUE1092C	HUE1093C	HUE1158B
HUE1071C	UNIFIED CHASSIS, 30-WATT (406 – 420 MHz)	●																			
HUE1072C	UNIFIED CHASSIS, 30-WATT (450 – 470 MHz)		●																		
HUE1159B	UNIFIED CHASSIS, 30-WATT (470 – 512 MHz)			●																	
HUE1081C	UNIFIED CHASSIS, 50-WATT (406 – 420 MHz)				●																
HUE1082C	UNIFIED CHASSIS, 50-WATT (450 – 470 MHz)					●															
HUE1163B	UNIFIED CHASSIS, 50-WATT (470 – 512 MHz)						●														
HUE1118C	UNIFIED CHASSIS, 75/100-WATT (406 – 420 MHz)							●													
HUE1092C	UNIFIED CHASSIS, 75/100-WATT (450 – 470 MHz)								●												
HUE1093C	UNIFIED CHASSIS, 75/100-WATT (470 – 494 MHz)									●											
HUE1158B	UNIFIED CHASSIS, 75/100-WATT (494 – 512 MHz)										●										
■ HLE1001C	POWER AMPLIFIER, 30-WATT (406 – 420 MHz)											●									
■ HLE1002C	POWER AMPLIFIER, 30-WATT (450 – 512 MHz)												●	●							
■ HLE1011C	POWER AMPLIFIER, 50-WATT (406 – 420 MHz)														●						
■ HLE1012C	POWER AMPLIFIER, 50-WATT (450 – 512 MHz)															●	●				
■ HLE1031B	POWER AMPLIFIER, 75/100-WATT (406 – 420 MHz)																	●			
■ HLE1032B	POWER AMPLIFIER, 75/100-WATT (450 – 492 MHz)																		●	●	
■ HLE1033B	POWER AMPLIFIER, 75/100-WATT (494 – 512 MHz)																				●
HLE4121B	MAIN BOARD, UHF (406 – 420 MHz)											●			●			●			
HLE4122B	MAIN BOARD, UHF (450 – 470 MHz)												●			●			●		
HLE4123A	MAIN BOARD, UHF (470 – 512 MHz)													●			●			●	●
HLE4105A	RF DECK, UHF (406 – 420 MHz)											●			●			●			
HLE4106A	RF DECK, UHF (450 – 470 MHz)												●			●			●		
HLE4107A	RF DECK, UHF (470 – 512 MHz)													●			●			●	●
HLN4195B	HARDWARE KIT											●	●	●	●	●	●				
HLN4033A	BOTTOM COVER, INNER, AND GASKET											●	●	●	●	●	●				
HLN4019A	HARDWARE WIRING KIT											●	●	●	●	●	●	●	●	●	●
HLN4192B	INTERCONNECT BOARD											●	●	●	●	●	●	●	●	●	●
HLN4198B	HARDWARE KIT, HIGH-POWER, 75/100-WATT																	●	●	●	●
HLN4047A	HARDWARE WIRING KIT, HIGH-POWER																	●	●	●	●
HLN4189A	HARDWARE	●	●	●	●	●	●	●	●	●	●										

EPW-0032-A

MOTOROLA INC.

Communications Group

instruction manual revision

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct your manual accordingly.

INSTRUCTION MANUAL AFFECTED:

68P81045E75-A MITREK Two-Way FM Radio, 406–420 MHz and 450–512 MHz 30/50/75/100 W

REVISION DETAILS:

1. In Instruction Section **68P81041E33-B**, on the top right of Diagram EEPS-27192-C: replace "C860M" with "C865M".

2. In Instruction Section **68P81041E33-B** on the back page, locate Parts List PL-6273-C: replace "C860M" with "C865M".

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WMR-0057
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Communications Group

instruction manual revision

Supersedes WMR-0053 and SMR-4277

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct your manual accordingly.

INSTRUCTION MANUALS AFFECTED:

68P81045E75-A MITREK Two-Way FM Radio, 406 – 420 MHz and 450 – 512 30/50/75/100 W

REVISION DETAILS:

1. Please add the attached table of contents and pages ii, iii, and iv to your manual and delete the present table of contents and pages ii, iii, and iv.

2. Please add attached Instruction Sections PEPS-26612-E and PEPS-26613-F, the functional block diagram (EEPS-27273-B) page 9, and 68P81039E21-D (Sheet 1 of 5) to your manual and delete Instruction Sections PEPS-26612-E and PEPS-26613-E, the functional block diagram (EEPS-27273-A) page 9, and 68P81039E21-D (Sheet 1 of 5).

3. Please add attached Instruction Sections 68P80200W06-O and 68P81039E23-G to your manual and delete Instruction Sections 68P81039E22-F and 68P81039E23-F

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WMR-0071
GGI 9-23-83

MOTOROLA INC.
Communications Group

"MITREK" TWO-WAY FM RADIO

406-410 MHz
450-512 MHz
30/50/75/100 Watts

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68P81045E75-A
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MODEL CHART
FOR
UHF "MITREK" MOBILE RADIO
(406-420 MHz) 30/50/100 W
(450-470 MHz) 30/50/75/100 W
(470-512 MHz) 19/39/59/75 W
(50/100/150/200 W ERP)

CODE:

- ● = ONE ITEM SUPPLIED
- ⁄ = ONE ITEM SUPPLIED DEPENDENT UPON FREQUENCY RANGE
- 4 = QUANTITY SUPPLIED
- ■ = BREAKDOWN ON SEPARATE CHART

MODEL NUMBER	DESCRIPTION
30-WATT MODELS	
T34JJA1000BK	1-FREQUENCY CARRIER SQUELCH
T34JJA1900BK	4-FREQUENCY CARRIER SQUELCH
T34JJA3000CK	1-FREQUENCY "PRIVATE-LINE"
T34JJA3900CK	4-FREQUENCY "PRIVATE-LINE"
T34JJA6000BK	1-FREQUENCY DIGITAL "PRIVATE-LINE"
T34JJA6900BK	4-FREQUENCY DIGITAL "PRIVATE-LINE"
50-WATT MODELS	
T44JJA1000BK	1-FREQUENCY CARRIER SQUELCH
T44JJA1900BK	4-FREQUENCY CARRIER SQUELCH
T44JJA3000CK	1-FREQUENCY "PRIVATE-LINE"
T44JJA3900CK	4-FREQUENCY "PRIVATE-LINE"
T44JJA6000BK	1-FREQUENCY DIGITAL "PRIVATE-LINE"
T44JJA6900BK	4-FREQUENCY DIGITAL "PRIVATE-LINE"
75-WATT MODELS	
T64JJA1000BK	1-FREQUENCY CARRIER SQUELCH
T64JJA1900BK	4-FREQUENCY CARRIER SQUELCH
T64JJA3000CK	1-FREQUENCY "PRIVATE-LINE"
T64JJA3900CK	4-FREQUENCY "PRIVATE-LINE"
T64JJA6000BK	1-FREQUENCY DIGITAL "PRIVATE-LINE"
T64JJA6900BK	4-FREQUENCY DIGITAL "PRIVATE-LINE"
100-WATT MODELS	
T74JJA1000BK	1-FREQUENCY CARRIER SQUELCH
T74JJA1900BK	4-FREQUENCY CARRIER SQUELCH
T74JJA3000CK	1-FREQUENCY "PRIVATE-LINE"
T74JJA3900CK	4-FREQUENCY "PRIVATE-LINE"
T74JJA6000BK	1-FREQUENCY DIGITAL "PRIVATE-LINE"
T74JJA6900BK	4-FREQUENCY DIGITAL "PRIVATE-LINE"

ITEM	DESCRIPTION
■ HUE1001B	UNIFIED CHASSIS, 30-WATT (406-420 MHz)
■ HUE1002B	UNIFIED CHASSIS, 30-WATT (450-470 MHz)
■ HUE1147A	UNIFIED CHASSIS, 30-WATT (470-512 MHz)
■ HUE1011B	UNIFIED CHASSIS, 50-WATT (406-420 MHz)
■ HUE1012B	UNIFIED CHASSIS, 50-WATT (450-470 MHz)
■ HUE1153A	UNIFIED CHASSIS, 50-WATT (470-512 MHz)
■ HUE1031B	UNIFIED CHASSIS, 100/75-WATT (406-420 MHz)
■ HUE1032B	UNIFIED CHASSIS, 100/75-WATT (450-470 MHz)
■ HUE1033B	UNIFIED CHASSIS, 100/75-WATT (470-494 MHz)
■ HUE1152A	UNIFIED CHASSIS, 100/75-WATT (494-512 MHz)
HLN4181A	"PRIVATE-LINE" BOARD
HLN4011A	"DIGITAL PRIVATE-LINE" BOARD
TRN4224A	CODE PLUG
TRN6005A	CODE PLUG
KXN1086B	CHANNEL ELEMENT RECEIVER
KXN1088A	CHANNEL ELEMENT TRANSMITTER
HHN4000A	HOUSING, TOP COVER, LOW POWER
HHN4001A	HOUSING, TOP COVER, HIGH POWER
HLN4034A	HOUSING, BOTTOM COVER
HCN4000A	CONTROL HEAD (1-FREQUENCY), CARRIER SQUELCH
HCN4001A	CONTROL HEAD (4-FREQUENCY), CARRIER SQUELCH
HCN4002A	CONTROL HEAD (1-FREQUENCY), "PRIVATE-LINE"
HCN4001A	CONTROL HEAD (4-FREQUENCY), "PRIVATE-LINE"
HMN4000B	MICROPHONE
HSN4000A	SPEAKER
HKN4000A	CONTROL CABLE (17-FT), 1-FREQUENCY
HKN4001A	CONTROL CABLE (17-FT), 4-FREQUENCY
HKN4016A	CONTROL CABLE (17-FT), 1-FREQUENCY, HIGH POWER
HKN4017A	CONTROL CABLE (17-FT), 4-FREQUENCY, HIGH POWER
HKN4041A	CABLE, FUSE AND RED LEAD, HIGH POWER
HLN4024A	MICROPHONE HANGUP BOX
TAE6061B	ANTENNA (406-430 MHz)
TAE6062B	ANTENNA (450-470 MHz)
TAE6094B	ANTENNA (470-494 MHz)
TAE6095B	ANTENNA (494-512 MHz)
HLN4022A	INSTALLATION KIT
HLN4023A	TUNING TOOL KIT

EPW-0031-A

"MITREK"
TWO-WAY FM RADIO
UNIFIED CHASSIS MODEL CHART
406-420 MHz
450-470 MHz
470-494 MHz
494-512 MHz
30/50/75/100 WATTS

CODE:

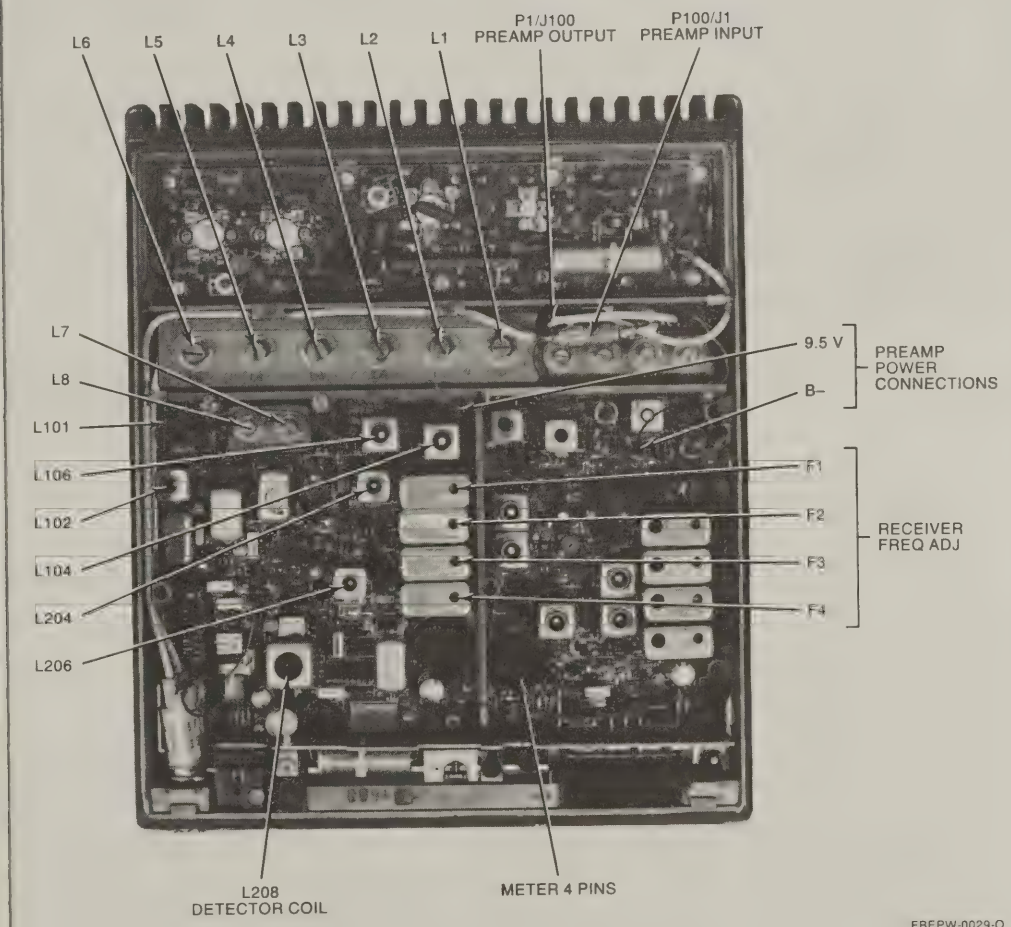
● = ONE ITEM SUPPLIED

■ = BREAKDOWN ON SEPARATE CHART

MODEL NUMBER	DESCRIPTION
HUE1001B	UNIFIED CHASSIS, 30W (406-420 MHz)
HUE1002B	UNIFIED CHASSIS, 30W (450-470 MHz)
HUE1147A	UNIFIED CHASSIS, 30W (470-512 MHz)
HUE1011B	UNIFIED CHASSIS, 50W (406-420 MHz)
HUE1012B	UNIFIED CHASSIS, 50W (450-470 MHz)
HUE1153A	UNIFIED CHASSIS, 50W (470-512 MHz)
HUE1031B	UNIFIED CHASSIS, 100/75W (406-420 MHz)
HUE1032B	UNIFIED CHASSIS, 100/75W (450-470 MHz)
HUE1033A	UNIFIED CHASSIS, 100/75W (470-494 MHz)
HUE1152A	UNIFIED CHASSIS, 100/75W (494-512 MHz)

	MODEL	DESCRIPTION	1001B	1002B	1147A	1011B	1012B	1153A	1031B	1032B	1033A	1152A
■	HLE1001C	POWER AMPLIFIER, 30-WATT (406-420 MHz)	●									
■	HLE1002C	POWER AMPLIFIER, 30-WATT (450-512 MHz)		●	●							
■	HLE1011C	POWER AMPLIFIER, 50-WATT (406-420 MHz)				●						
■	HLE1012C	POWER AMPLIFIER, 50-WATT (450-512 MHz)					●	●				
■	HLE1031B	POWER AMPLIFIER, 100/75-WATT (406-420 MHz)							●			
■	HLE1032B	POWER AMPLIFIER, 100/75-WATT (450-494 MHz)								●	●	
■	HLE1033B	POWER AMPLIFIER, 100/75-WATT, (494-512 MHz)										●
	HLE4001C	MAIN BOARD, UHF (406-420 MHz)	●			●			●			
	HLE4002C	MAIN BOARD, UHF (450-470 MHz)		●			●			●		
	HLE4158A	MAIN BOARD, UHF (470-512 MHz)			●			●			●	●
	HLE4105A	RF DECK, UHF (406-420 MHz)	●			●			●			
	HLE4106A	RF DECK, UHF (450-470 MHz)		●			●			●		
	HLE4107A	RF DECK, UHF (470-512 MHz)			●			●			●	●
	HLN4015B	HARDWARE KIT	●	●	●	●	●	●				
	HLN4019A	HARDWARE WIRING KIT	●	●	●	●	●	●				
	HLN4033A	BOTTOM COVER, INNER, AND GASKET	●	●	●	●	●	●	●	●	●	●
	HLN4044A	INTERCONNECT BOARD	●	●	●	●	●	●	●	●	●	●
	HLN4036B	HARDWARE KIT, HI-POWER, 100/75 W							●	●	●	●
	HLN4047A	HARDWARE WIRING KIT, HI-POWER							●	●	●	●
	HLN4189A	HARDWARE	●	●	●	●	●	●	●	●	●	●

EPW-0032-O



Receiver Adjustment Points

"MITREK"
TWO-WAY FM RADIO
UNIFIED CHASSIS MODEL CHART
406-420 MHz
450-470 MHz
470-494 MHz
494-512 MHz
30/50/75/100 WATTS

CODE:

● = ONE ITEM SUPPLIED

■ = BREAKDOWN ON SEPARATE CHART

MODEL NUMBER	DESCRIPTION
HUE1001B	UNIFIED CHASSIS, 30W (406-420 MHz)
HUE1002B	UNIFIED CHASSIS, 30W (450-470 MHz)
HUE1147A	UNIFIED CHASSIS, 30W (470-512 MHz)
HUE1011B	UNIFIED CHASSIS, 50W (406-420 MHz)
HUE1012B	UNIFIED CHASSIS, 50W (450-470 MHz)
HUE1153A	UNIFIED CHASSIS, 50W (470-512 MHz)
HUE1031B	UNIFIED CHASSIS, 100/75W (406-420 MHz)
HUE1032B	UNIFIED CHASSIS, 100/75W (450-470 MHz)
HUE1033A	UNIFIED CHASSIS, 100/75W (470-494 MHz)
HUE1152A	UNIFIED CHASSIS, 100/75W (494-512 MHz)

	MODEL	DESCRIPTION	1001B	1002B	1147A	1011B	1012B	1153A	1031B	1032B	1033A	1152A
■	HLE1001C	POWER AMPLIFIER, 30-WATT (406-420 MHz)	●									
■	HLE1002C	POWER AMPLIFIER, 30-WATT (450-512 MHz)		●	●							
■	HLE1011C	POWER AMPLIFIER, 50-WATT (406-420 MHz)				●						
■	HLE1012C	POWER AMPLIFIER, 50-WATT (450-512 MHz)					●	●				
■	HLE1031B	POWER AMPLIFIER, 100/75-WATT (406-420 MHz)							●			
■	HLE1032B	POWER AMPLIFIER, 100/75-WATT (450-494 MHz)								●	●	
■	HLE1033B	POWER AMPLIFIER, 100/75-WATT, (494-512 MHz)										●
	HLE4001C	MAIN BOARD, UHF (406-420 MHz)	●			●			●			
	HLE4002C	MAIN BOARD, UHF (450-470 MHz)		●			●			●		
	HLE4158A	MAIN BOARD, UHF (470-512 MHz)			●			●			●	●
	HLE4105A	RF DECK, UHF (406-420 MHz)	●			●			●			
	HLE4106A	RF DECK, UHF (450-470 MHz)		●			●			●		
	HLE4107A	RF DECK, UHF (470-512 MHz)			●			●			●	●
	HLN4015B	HARDWARE KIT	●	●	●	●	●	●				
	HLN4019A	HARDWARE WIRING KIT	●	●	●	●	●	●				
	HLN4033A	BOTTOM COVER, INNER, AND GASKET	●	●	●	●	●	●	●	●	●	●
	HLN4044A	INTERCONNECT BOARD	●	●	●	●	●	●	●	●	●	●
	HLN4036B	HARDWARE KIT, HI-POWER, 100/75 W							●	●	●	●
	HLN4047A	HARDWARE WIRING KIT, HI-POWER							●	●	●	●
	HLN4189A	HARDWARE	●	●	●	●	●	●	●	●	●	●

EPW-0032-O

REQUIRED TEST EQUIPMENT FOR "MITREK" RADIO SERVICING

General Type	Application	Recommended Model	Minimum Specifications
AC-DC VOM	DC voltage measurements, general	Motorola T1009A	Measurement range: 0-15 V dc Sensitivity: 20,000 ohms/volt
DC Multimeter	DC voltage readings requiring a high input resistance meter	Motorola S1063B	Measurement range: 0-15 V dc Input resistance: 11 megohms
AC Voltmeter	Audio voltage measurements	Motorola S1053C	Measurement range: 0-10 V ac Input resistance: 10 megohms
RF Voltmeter	RF voltage measurements	Motorola S1339A	Measurement range: 100 uV-3 V from 1 MHz-512 MHz Inputs: 50 ohm and high impedance
Oscilloscope	Waveform observation	Motorola R1004A	Vertical sensitivity: 5 mV - 10 V/division Horizontal time base: 0.2 usec. 0.5 sec/division
RF Wattmeter	Transmitter output power measurement	Motorola S1350A with appropriate element and T1013A RF Dummy Load	Measurement range: 0-50 Watts, 0-100 Watts
Frequency Meter	Transmitter frequency measurement	Model R1200A Service Monitor with high stability oscillator (X suffix) option. Frequency calibration recommended every 6 months or less.	Measurement range: 1-512 MHz Frequency resolution: 10 Hz
Deviation Meter	Transmitter modulation deviation	Motorola R1200A Service Monitor	Measurement range: 0-10 kHz deviation Frequency range: 406-512 MHz
RF Signal Generator	Receiver alignment and troubleshooting	Motorola R1200A Service Monitor with attenuator	Frequency range: 406-512 MHz Output Level: 0.1 uV-100,000 uV Must be capable of at least ±3 kHz deviation when modulated by 1 kHz tone.
Audio Signal Generator	Audio circuit troubleshooting	Motorola S1067B	Frequency range: 20 Hz-20 kHz Output Level: 50 mV-1 V
PL Tone Generator*	Tone-Coded "Private-Line" Decoder Troubleshooting	Motorola Si333B	Frequency range: 10 Hz-9999 Hz Output level: 0-3 V rms
DPL Test Set**	"Digital Private-Line" Encoder-Decoder Troubleshooting	Motorola SLN6413A	
Radio Test Set w/appropriate metering cable SKN6012B	Meter readings at circuit metering points for alignment and troubleshooting	Motorola S1056B Portable Test Set, TEK5B-E Metering Panel with RPX4053A Conversion Kit, or TEK5F Metering Panel.	
Tuning Tool Kit	Receiver and transmitter alignment	Motorola HLN4023A	
DC Power Supply	DC power for shop service	Motorola R1011AA	1-20 V DC 0-40A

*Required for tone-coded "Private-Line" models only.
**Required for "Digital Private-Line" models only.

NOTE

If version B through E of the TEK-5 Portable Test Set are used ***they must first be modified*** using RPX4053A Conversion Kit.

FREQUENCY CALCULATIONS

FREQUENCY	CALCULATION
406-420 MHz 450-512 MHz	$fo = \frac{fc - 10.7}{9}$

Where fo = crystal frequency, fc = carrier frequency

POSITIVE GROUND SYSTEMS

CAUTION

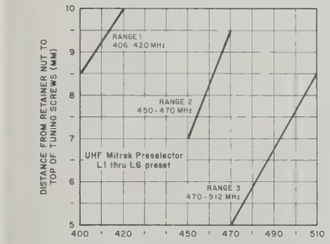
In positive ground systems the case of the TEK-5 Meter Panel and portions of the S1056B Portable Test Set are hot with respect to the vehicle chassis due to the nature of the positive ground installation. Take necessary precautions that the test equipment does not contact the vehicle chassis.

UHF "MITREK" RECEIVER ALIGNMENT PROCEDURE

1. To perform this tuning procedure, use either the Motorola portable test set or the TEK-5 on Position A. When using the TEK-5F or modified TEK-5B through modified TED-5E meter panels, put the M1, 2 polarity switch in the reverse position and ignore the polarity notes.
2. F_L is the lowest receive frequency; F_H is the highest. For single-frequency radios, $F_L = F_H$.
3. IMPORTANT: When using the Motorola portable test set for M4, put the FUNCTION SELECTOR SWITCH in the proper position for M4 operation.

Step	Test Set Meter Position	Adjust	Procedure
1.		L1-L6	Preset the RF preselector tuning screws per the preset chart.
2.		L7-L8	Preset the injection filter tuning screws 15mm (9/16 inch) above the retainer nuts.
3.		L104, L106	Preset the L104 and L106 coil slugs 13 turns below flush with the top of the coil form.
4.		L101	Preset the mixer gate coil slug to the bottom of the coil form. This is a final adjustment. (The 470-512MHz radio does not have L101.)
5.		L102	Preset the mixer drain coil slug 15 turns below flush with the top of the coil form.
6.		L204, L206	Preset the IF matching network coil slugs 8 turns below flush with the top of the coil form.
7.	2 (reverse)	L208	Starting with the slug flush with the top of the coil form, screw it in until Meter 2 **first** reads 24 uA. (No input signal is necessary).
8.*	6	L104, L106	Set the frequency selector to F_L. Starting with L104, alternately adjust the injection buffer coils ½ turn at a time *clockwise* until Meter 6 moves. Then adjust L104 and L106 for a peak reading on Meter 6. Check for multiple peaks and adjust for the highest peak.
NOTE: For single-frequency radios and for multiple-frequency radio with F_H-F_L less than or equal to 1 MHz, perform Steps 9-11. For multiple-frequency radios with F_H-F_L greater than 1 MHz, perform Steps 12-16.			
9.*	6	L104	For single-frequency radios, or if the Meter 6 reading on F_H is higher than on F_L, go to Step 10. Otherwise, adjust L104 so that the reading on Meter 6 is *balanced* between F_L and F_H. Repeat Step 9 until the *highest* possible *balanced* reading is obtained.
10.*	6	L7	Set the frequency selector to F_L. Adjust L7 *clockwise* for a *peak* on Meter 6.
11.*	6	L8	Adjust L8 *clockwise* for a *dip* on Meter 6. Go to Step 17.
*Do NOT repeat Steps 8 and 9 (L104, L106) after doing Step 10 (L7). Do NOT repeat Step 10 after doing Step 11 (L8).			
12.†	6	L104	If the Meter 6 reading on F_H is higher than the Meter 6 reading on F_L, go to Step 13. Otherwise, adjust L104 so that the reading on Meter 6 is *balanced* between F_L and F_H. Repeat Step 12 until the *highest* possible *balanced* reading is obtained.
13.†	6	L7	Set the frequency selector to F_L. Adjust L7 *clockwise* for a *peak* on Meter 6.
14.†	6	L7	Adjust L7 *counterclockwise* for a 2 uA *reduction* in the Meter 6 reading.
15.†	6	L8	Adjust L8 *clockwise* for *a dip* on Meter 6.
16.†	6	L8	Adjust L8 *counterclockwise* for a 1 uA *increase* in the Meter 6 reading.
†Do NOT repeat Step 12 (L104, L106) after doing Step 13 (L7). Do NOT repeat Steps 13 and 14 after doing Step 15 (L8).			
17.	1 (Reverse)	L1-L6	Set the rf generator to the F_L carrier frequency (±100Hz) and adjust the output level for 35 uA on Meter 1. Adjust L1 through L6 in order *clockwise* for a peak reading on Meter 1. While making this adjustment, adjust the rf signal generator output to maintain Meter 1 between 30 and 40 uA. (If you cannot obtain a Meter 1 reading between 30-40 uA initially, adjust L1 through L6 ½ turn clockwise. Repeat this until Meter 1 reads 30-40 uA. Then complete Step 17.)
18.	1 (Reverse) 4	Receiver Oscillator Warp	For each frequency: Set the rf generator to the carrier frequency (±100Hz) and adjust the output level for a Meter 1 reading of 35 uA. Activate the Meter 4 circuit by shorting the Meter 4 enable pins. Adjust the oscillator frequency for a *zero* reading on Meter 4.
19.	1 (Reverse)	L102, L204, L206	Set the rf signal generator to F_L, apply standard test modulation (1 KHz tone, ± 3 KHz deviation) to the generator, and adjust the output level for 35 uA on Meter 1). Adjust the IF coils for a *peak* reading on Meter 1 while maintaining Meter 1 between 30 uA and 40 uA by adjusting the generator output. Repeat until there is no further improvement.
20.	7 (AC voltmeter across the speaker)	L208	With the same conditions as in Step 19, adjust L208 slowly for *maximum* audio voltage across the speaker.
21.	1 (Reverse)	L1-L6	If F_H is 400-460 MHz or 470-494 MHz, adjust L1 through L5 ¼ turn *counterclockwise* and L6 ½ turn *counterclockwise*. If FH is 460-470 MHz or 494-512 MHz, adjust L1 through L5 ½ turn *counterclockwise* and L6 one turn *counterclockwise*
22.	1 (Reverse)	L1-L5	Set the frequency selector to F_L, remove the test modulation, and adjust the output level for 35 uA on Meter 1. Adjust L1 through L5 *in order* clockwise for a peak reading on Meter 1 while maintaining Meter 1 between 30 uA and 40 uA by adjusting the rf signal generator output. Do NOT repeat this step without having repeated Steps 1, 17, and 21 first.
23.	(AC voltmeter across the speaker)	L6	For single-frequency radios, or if F_H-F_L is less than or equal to 1.8 MHz, adjust L6 for best quieting on F_L. If F_H-F_L is greater than 1.8 MHz, adjust L6 for best *balanced* quieting between F_L and F_H.
24.	1 (Reverse) 4	Receiver Oscillator Warp	Repeat Step 18

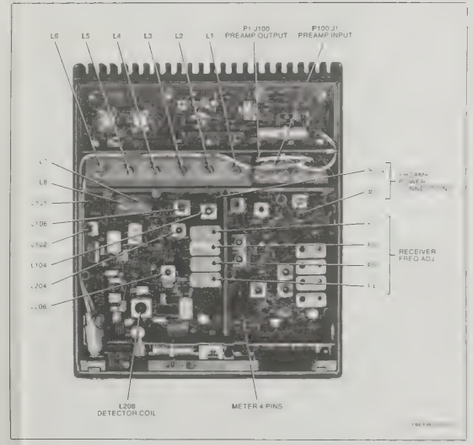
Receiver alignment is complete.



NOTE
The tuning procedure is written for use with the Motorola portable test set. If using the Tek5-F or modified Tek5-B through Tek5-E meter panels, put the M1,2 polarity switch in the reverse position and ignore the indicated polarity notes.

BEP#-0022-0

Positions of Tuning Screws for Various Frequency Ranges



Receiver Adjustment Points

UHF "MITREK"
RECEIVER ALIGNMENT

RECEIVER ALIGNMENT/TRANSMITTER ALIGNMENT

Receiver Alignment Procedure
Motorola No. PEPS-26612-E
GGI 9-23-83

OSCILLATOR FREQUENCY ADJUSTMENT

on frequency" should be done *after* the transmitter has been aligned, but *before* transmitter d set. To set the oscillator on frequency, perform the following steps:

quency meter as described in the frequency meter instruction manual.

ncy selector switch on the control head to the F1 position (multi-frequency units only).

mitter with no modulation using the portable test set. On "Private-Line" or "Digital Private- odels, disable the "Private-Line" encoder by shorting the code disable points on the "Private- te-Line" encoder/decoder board.

FREQ ADJ control for proper readings on the frequency meter. If the frequency as indicated r is too low, turn the T1 FREQ ADJ control counterclockwise, if too high, turn the control ency to within ±225 Hz.

ncy selector switch to the F2 position and repeat Step 4 using the T2 FREQ ADJ control.

for F3 and F4, respectively.

Line" or "Digital Private-Line" models, remove the short added in Step 3.

NOTE
Omit Steps 5 and 6 for single frequency units.

DEVIATION ADJUSTMENT

The oscillator frequency adjustment must be made *before* this adjustment.

tput leads of the tone oscillator through a 0.33-μF capacitor to the transmitter audio input (micro-

voltmeter across the audio oscillator and adjust the tone generator output to 1 volt at 1000 Hz. disable the encoder by turning R23 on the PL board fully counterclockwise. On Digital Private- de disable points.

ency selector switch to F1 and key the transmitter. Adjust F1 DEV ADJ for:

Carrier Squelch Radio	4.8 kHz
PL/DPL Radio	4.0 kHz

models, adjust the F2, F3, and F4 deviation with the frequency selector switch in the correspond- letes the deviation adjustment for carrier squelch radios.

e or Digital Private-Line radios, disconnect the audio oscillator. On Private-Line radios adjust to set PL DEV to 700 Hz. No deviation adjustment is required for DPL radios. Private-Line deviation should read 750 Hz ±250 Hz. Reconnect the audio oscillator. Readjust DEV ADJ mit channels.

FINAL METER READINGS

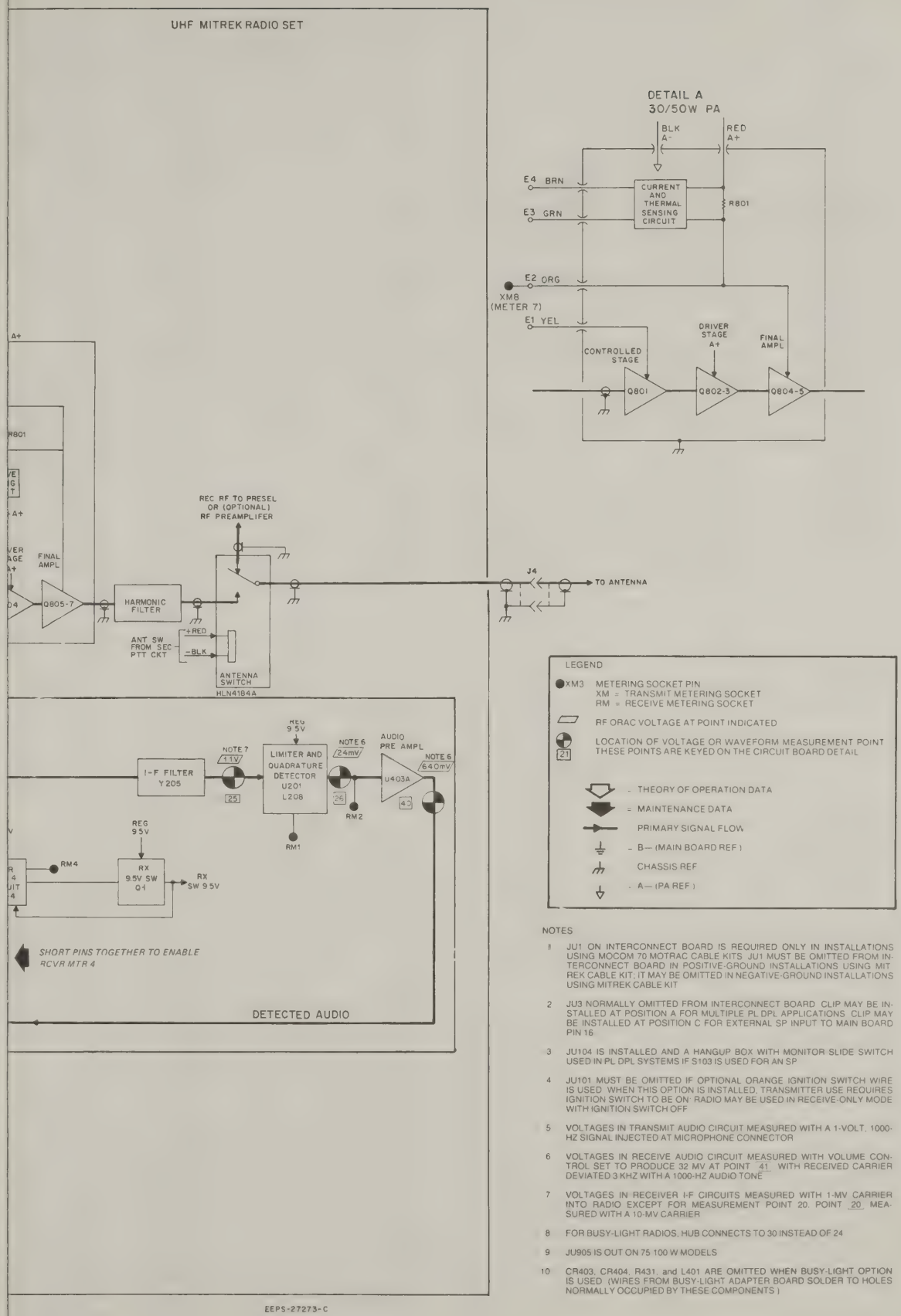
itter is aligned or tested, final meter readings should be made and entered in a logbook.

3 and M5 are purely relative and do not give actual current or voltage measurements.

ampere scale reading obtained at M7 by 0.7 (30 W), 0.8 (50 W), or 1.1 (75/100 W) to determine plifier current in amperes.

ER IS PROPERLY ALIGNED, METER DEFLECTIONS SHOULD FALL WITHIN THE LIMITS SHOWN IN

ETER 3	METER 5	METER 6	METER 7
(min)	10 (min)	6 (min)	17 (max) 50 W or 100 W radios)
(max)	50 (max)	50 (max)	13 (max) 75 W radios)
se of irst ubler	Base of Low Level Ampl	Input of Exciter Filter	Final Ampl Current



LEGEND

- XM3 METERING SOCKET PIN
  XM = TRANSMIT METERING SOCKET
  RM = RECEIVE METERING SOCKET
- RF ORAC VOLTAGE AT POINT INDICATED
- LOCATION OF VOLTAGE OR WAVEFORM MEASUREMENT POINT THESE POINTS ARE KEYED ON THE CIRCUIT BOARD DETAIL
- = THEORY OF OPERATION DATA
- = MAINTENANCE DATA
- PRIMARY SIGNAL FLOW
- B— (MAIN BOARD REF.)
- CHASSIS REF.
- A— (PA REF.)

NOTES

1. JU1 ON INTERCONNECT BOARD IS REQUIRED ONLY IN INSTALLATIONS USING MOCOM 70 MOTRAC CABLE KITS. JU1 MUST BE OMITTED FROM INTERCONNECT BOARD IN POSITIVE-GROUND INSTALLATIONS USING MITREK CABLE KIT; IT MAY BE OMITTED IN NEGATIVE-GROUND INSTALLATIONS USING MITREK CABLE KIT.
2. JU3 NORMALLY OMITTED FROM INTERCONNECT BOARD. CLIP MAY BE INSTALLED AT POSITION A FOR MULTIPLE PL DPL APPLICATIONS. CLIP MAY BE INSTALLED AT POSITION C FOR EXTERNAL SP INPUT TO MAIN BOARD PIN 16.
3. JU104 IS INSTALLED AND A HANGUP BOX WITH MONITOR SLIDE SWITCH USED IN PL DPL SYSTEMS IF S103 IS USED FOR AN SP.
4. JU101 MUST BE OMITTED IF OPTIONAL ORANGE IGNITION SWITCH WIRE IS USED. WHEN THIS OPTION IS INSTALLED, TRANSMITTER USE REQUIRES IGNITION SWITCH TO BE ON. RADIO MAY BE USED IN RECEIVE-ONLY MODE WITH IGNITION SWITCH OFF.
5. VOLTAGES IN TRANSMIT AUDIO CIRCUIT MEASURED WITH A 1-VOLT, 1000-HZ SIGNAL INJECTED AT MICROPHONE CONNECTOR.
6. VOLTAGES IN RECEIVE AUDIO CIRCUIT MEASURED WITH VOLUME CONTROL SET TO PRODUCE 32 MV AT POINT 41 WITH RECEIVED CARRIER DEVIATED 3 KHZ WITH A 1000-HZ AUDIO TONE.
7. VOLTAGES IN RECEIVER I-F CIRCUITS MEASURED WITH 1-MV CARRIER INTO RADIO EXCEPT FOR MEASUREMENT POINT 20. POINT 20 MEASURED WITH A 10-MV CARRIER.
8. FOR BUSY-LIGHT RADIOS, HUB CONNECTS TO 30 INSTEAD OF 24.
9. JU905 IS OUT ON 75-100 W MODELS.
10. CR403, CR404, R431, and L401 ARE OMITTED WHEN BUSY-LIGHT OPTION IS USED. (WIRES FROM BUSY-LIGHT ADAPTER BOARD SOLDER TO HOLES NORMALLY OCCUPIED BY THESE COMPONENTS.)

UHF "MITREK"
TRANSMITTER ALIGNMENT

FREQUENCY	CALCULATION
406-420 MHz	f_c
450-512 MHz	$\frac{f_c}{36}$

Where f_c = crystal frequency, f_c = carrier frequency*

CAUTION

Do not key the transmitter for more than a few seconds at a time until it is properly tuned. Turn on the transmitter for brief periods while reading the meter and making the adjustments.

Transmitter Alignment Procedure
Motorola No. PEPS-26613-F
GGI 9-23-83

UHF "MITREK" TRANSMITTER TUNING PROCEDURE FOR 75/100 WATT MODELS

1. The tune-up procedure has been written for use with the Motorola portable test set of the TEK-5 set to position A.
2. Start multi-frequency tune-ups at the lowest frequency.

Step	Test Switch Position	Adjustment	Procedure
1	None	L701-708*, L9-12, R909, R911, R813	Preset L702, L704, L705, L706, L707 and L708 to be flush with top of can. Set L701 and L703 7 turns in from top of can. Set L9-L12 1/4 inch (6 mm) above filter casting. Set R909 and R813 fully clockwise. Set R911 at mid rotation.
2	M3	L701-703	Peak L702, then peak L701, L702, and L703.
3	M3	L704, L705	Dip L704, then peak L705.
4	M5	L706, L707, L704, L705	Peak L706, L707, L704, and L705 in that order.
5	M6	L708*	Peak L708* for peak that is closest to bottom of coil. Peak should occur close to a *dip* MTR5.
	For wide-space operation, go to Step 12.		
6	M6	L9-11	Turn counterclockwise and dip L9, peak L10, and dip L11.
7	M7	L12	Turn counterclockwise and peak L12. *If no MTR 7 indication is observed,* preset L9, L10, L11, L12 (Step 1) and go back to Step 6. *If definite peak of L12 cannot be obtained,* rotate R911 counterclockwise until MTR 7 drops to 15 uA or maximum counterclockwise position and repeak L12.
8	M6	L708*	Peak L708*.
9	M7	R911	Rotate 911 fully clockwise and note MTR 7. Rotate R911 counterclockwise until MTR 7 drops by 1 uA. *If no change is observed,* set R911 fully counterclockwise.
10	Wattmeter	R813	Rotate R813 until power output decreases to 120 W *for 100 W, 406-420 MHz, 450-470 MHz operation,* or 100 W *for both 75 W 406-420 MHz, 450-512 MHz operation and 200 W (ERP) 470-512 MHz operation. If output power is less than, or equal to, required set power before adjustment,* rotate R813 until power just begins to drop.
11	Wattmeter	R909	Set R909 to 110 W *for 100 W 406-420 MHz, 450-470 MHz operation,* or 83 W *for 75 W 406-420 MHz, 450-470 MHz operation,* or 86 W *for 200 W (ERP) 470-512 MHz operation or 65 W for 150 W (ERP) 470-512 MHz operation.*
	This completes the alignment for single frequency radios, For multi-frequency radios, perform the following steps.		
12	M3	L701, L703	Peak L701, L703 on *highest* frequency.
13	M3	L702	Peak L702 on lowest frequency.
14	M5	L706, L707, L704	Peak L706, L707 for highest peak on *highest* frequency. If meter 5 is less than 10, balance M5 between lowest and highest frequency using L704 and L706.
15	M6	L708*	Peak L708* on peak closest to bottom of coil on *highest* frequency.
16	M6	L9-11	Turn counterclockwise and dip L9, peak L10, and dip L11 on *highest* frequency. (L9 may have a shallow dip.)
17	M7	L12	Peak L12 on *highest* frequency. *If no MTR 7 indication is observed,* preset L9, L10, L11, L12 (Step 1) and go back to Step 16. *If definite peak of L12 cannot be obtained,* rotate R911 counterclockwise until MTR 7 drops to 15 uA or maximum counterclockwise position and repeak L12.
18	M6	L708*	On the *lowest* frequency, peak L708* on peak closest to bottom of coil.
19	M7	On the lowest frequency, L10, L11	Turn L10, L11 clockwise 45 ° (1/8 turn). *If no MTR 7 is shown,* then preset L9, L10, L11, L12 (Step 1) and go back to Step 16. If required, go back to Step 1.
20	M7	R911	Rotate R911 fully clockwise and note MTR 7 for all transmit frequencies. At frequency of highest MTR 7 reading, rotate R911 for a 1 uA drop in MTR 7. *If MTR 7 has dropped by more than 1 uA for any other frequency,* use frequency of greatest drop to readjust R911 for a 1 uA drop in MTR 7.
21	Wattmeter	R813	On the *lowest* frequency, rotate R813 for a power output of 120 W *for 100 W, 406-420 MHz, 450-470 MHz operation,* or 100 W *for both 75 W, 406-420 MHz, 450-512 MHz operation, and 200 W (ERP) 470-512 MHz operation. If power output is less for any other transmit* frequency, use frequency of lowest power output to readjust R813. *If power output is less than required before adjusting R813,* adjust R813 until power output just begins to drop.
22	Wattmeter	R909	Set R909 to 110 W *for 100 W 406-420 MHz, 450-470 MHz operation,* or 83 W *for 75 W 406-420 MHz, 450-470 MHz operation,* or 86 W *for 200 W (ERP) 470-512 MHz operation, or 65 W for 150 W (ERP) 470-512 MHz operation.* Check all transmit frequencies to ensure no more than ± 8 W change *for 110 W set,* or ± 6 W *for 65 W, 83 W or 86 W set.* Readjust R909, if required, to maintain readings within these limits.

*L708 is tuneable only in 450-512 MHz radios.

UHF MITREK TRANSMITTER TUNING PROCEDURE FOR 30/50 WATT MODELS

1. The tune-up procedure has been written for use with the Motorola portable test set or the TEK-5 set to position A.
2. Start multi-frequency tune-ups at the lowest frequency.

Step	Test Set Switch Position	Adjustment	Procedure
1	None	L701-708*, L9-12, R909, R911, C800, C813*	Adjust L702, L704, L705, L706, L707 and L708* to be flush with top of can. Set L701 and L703 seven turns in from top of can. Set L9-L12 1/4 inch (6mm) above filter casting. Set R909 fully clockwise, R911 180° from fully counterclockwise or 90° from fully clockwise. Set C800, C813* 1/2 turn from tight.
2	M3	L702, L701, L702, L703	Peak L702, then peak L701, L702, L703
3	M3	L704, L705	Dip L704, then peak L705.
4	M5	L706, L707, L704, L705	Peak L706, L707, L704, L705 in that order.
5	M6	L708*	Peak L708* for peak that is closest to bottom of coil. Peak should occur close to a dip in meter 5.
	For wide-space operation, go to Step 13.		
6	M6	L9, L10, L11	Turn counterclockwise and dip L9, peak L10 and dip L11.
7	M7	L12	Peak L12. If no MTR 7 is observed, then preset L9, L10, L11, L12 and go back to Step 6.
8	M7	C813*	Peak C813*
9	M6	L708*	Peak L708*
10	Wattmeter	C800, R911	Peak C800. If 65 W (50 W radio) or 38 W (30 W radio) is not obtained, then increase R911 until the required power is obtained or no further increase is noted. If power is less than 55 W (50 W radio) or 36 W (30 W radio), then preset L9, L10, L11, L12, L708* and go back to Step 5. If necessary, go back to Step 1.
11	Wattmeter	R911, C813*	Set R911 to 65 W (50 W radio), 38 W (30 W radio), or to power level in Step 10. Retune C813*. Reset R911 if necessary.
12	Wattmeter	R909, C800	Set R909 for 55 W (50 W radio) or 34 W (30 W radio) and peak C800. Reset R909 if necessary.
	This completes alignment for single frequency radios. For multi-frequency radios, complete the following steps.		
			NOTE F_L - Lowest transmitter frequency. F_H - Highest transmitter frequency.
13	M3	L701, L703	On F_H: Peak L701, L703
14	M3	L702	On F_L: Peak L702.
15	M5	L704, L706, L707	On F_H: Peak L706, L707. If M5 is less than 10, balance M5 between lowest and highest frequency using L704 and L706.
16	M6	L708*	On F_H: Peak L708* on peak closest to bottom of coil.
17	M6	L9, L10, L11	On F_H: Turn counterclockwise and dip L9, peak L10, dip L11 (L9 may have shallow dip).
18	M7	L12	On F_H: Peak L12, if no indication, preset L9, L10, L11, L12 and go back to Step 17.
19	M7	C813*	On F_H: Peak C813*
20	Wattmeter	C800	On F_H: Peak C800. If power is less than 65 W (50 W radio) or 38 W (30 W radio), then increase R911 until the power is obtained or until no further increase in power is noted. If power is less than 55 W (50 W radio) or 36 W (30 W radio), then preset L9, L10, L11, L12, L708* and go back to Step 16. If needed go to Step 1.
21	M6	L708*	On F_L: Peak L708* on lowest frequency on peak closest to bottom of coil.
22	M7	L10, L11	On F_L: Turn L10, L11 clockwise in 45° (1/8 turn). If no MTR 7 is shown, then preset L9, L10, L11, L12 and go back to Step 17. If needed go to Step 1.
23	M7	C813*	On F_L: Peak C813*.
24	Wattmeter	C800, R911	Peak C800. Set R911 to 65 W (50 W radio) or 38 W (30 W radio), or to the same power obtained in Step 20. If the difference in power between all channels is less than or equal to 5 W (50 W radio) or 3 W (30 W radio), go to Step 25; if not, then go to Step 26.
25	Wattmeter	C800, R909	On lowest power channel, set R909 to 55 W (50 W radio) or 34 W (30 W radio) and repeak C800. Reset R909 if necessary. A balance of C800, may be necessary to achieve difference of less than 5 W (50 W radio) or 3 W (30 W radio). If the required balance cannot be achieved, then reset R909 full clockwise, and go to Step 26.
	Perform Step 26A if there is a difference of 5-8 W between any two channels. Perform Step 26B if the power difference between any two channels is greater than 8 W.		
26A	Wattmeter	C800, C813*	Balance power on all channels. R911 may have to be turned down to the proper power output. If balance cannot be achieved, go to Step 26B.
26B	Wattmeter	L9, L12	Balance power on all channels. Balancing of L9, L12 should not degrade the output power, of the channel having the highest output power, (as obtained in Step 26A), by more than 2W. If balance cannot be achieved, go to Step 26C.
26C	Wattmeter	L10, L11	On the lowest power channel, tune L10, L11 slightly (less than 1/8 turn). For an increase in power, go back to Step 26B.
	Once the required balancing is achieved, go to Step 25. If proper balancing cannot be obtained, preset R911, L708* L9-12, and go to Step 16.		

*C813 adjustments apply only to 50 W (450-512 MHz) radios. L708 is tuneable only in 450-512 MHz radios.

NOTE
L9-L12 should be all about the same height when properly tuned.

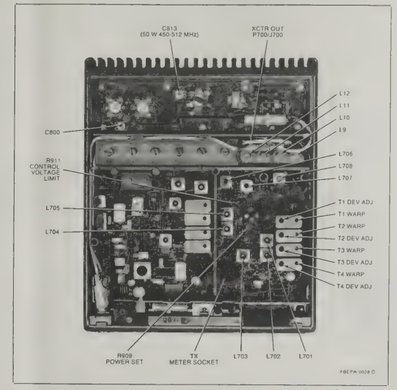


Figure 1. Transmitter Control Locations for 30/50 Watt Models

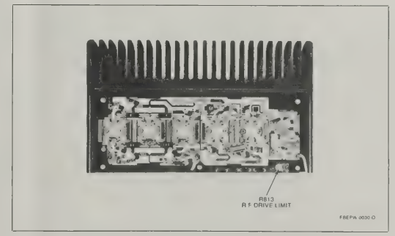


Figure 2. Power Amplifier Control Locations for 75/100 Watt Models

OSCILLATOR FREQUENCY ADJUSTMENT

Setting the oscillator "on frequency" should be done *after* the transmitter has been aligned, but *before* transmitter deviation is checked and set. To set the oscillator on frequency, perform the following steps:

Step 1. Set up the frequency meter as described in the frequency meter instruction manual.

Step 2. Set the frequency selector switch on the control head to the F1 position (multi-frequency units only)

Step 3. Key the transmitter with no modulation using the portable test set. On "Private-Line" or "Digital Private-Line" coded squelch models, disable the "Private-Line" encoder by shorting the code disable points on the "Private-Line" or "Digital Private-Line" encoder/decoder board.

Step 4. Adjust the T1 FREQ ADJ control for proper readings on the frequency meter. If the frequency as indicated on the frequency meter is too low, turn the T1 FREQ ADJ control counterclockwise, if too high, turn the control clockwise. Set the frequency to within ± 225 Hz.

Step 5. Set the frequency selector switch to the F2 position and repeat Step 4 using the T2 FREQ ADJ control

Step 6. Repeat Step 4 for F3 and F4, respectively.

Step 7. On "Private-Line" or "Digital Private-Line" models, remove the short added in Step 3

NOTE
Omit Steps 5 and 6 for single frequency units.

DEVIATION ADJUSTMENT

The oscillator frequency adjustment must be made *before* this adjustment

Step 1: Connect the output leads of the tone oscillator through a 0.33-μF capacitor to the transmitter audio input (microphone receptacle).

Step 2: Connect the ac voltmeter across the audio oscillator and adjust the tone generator output to 1 volt at 1000 Hz On Private-Line radios disable the encoder by turning R23 on the PL board fully counterclockwise. On Digital Private-Line radios short the code disable points

Step 3: Switch the frequency selector switch to F1 and key the transmitter. Adjust F1 DEV ADJ for

Carrier Squelch Radio	4.8 kHz
PL DPL Radio	4.0 kHz

For multiple-frequency models, adjust the F2, F3, and F4 deviation with the frequency selector switch in the corresponding position. This completes the deviation adjustment for carrier squelch radios

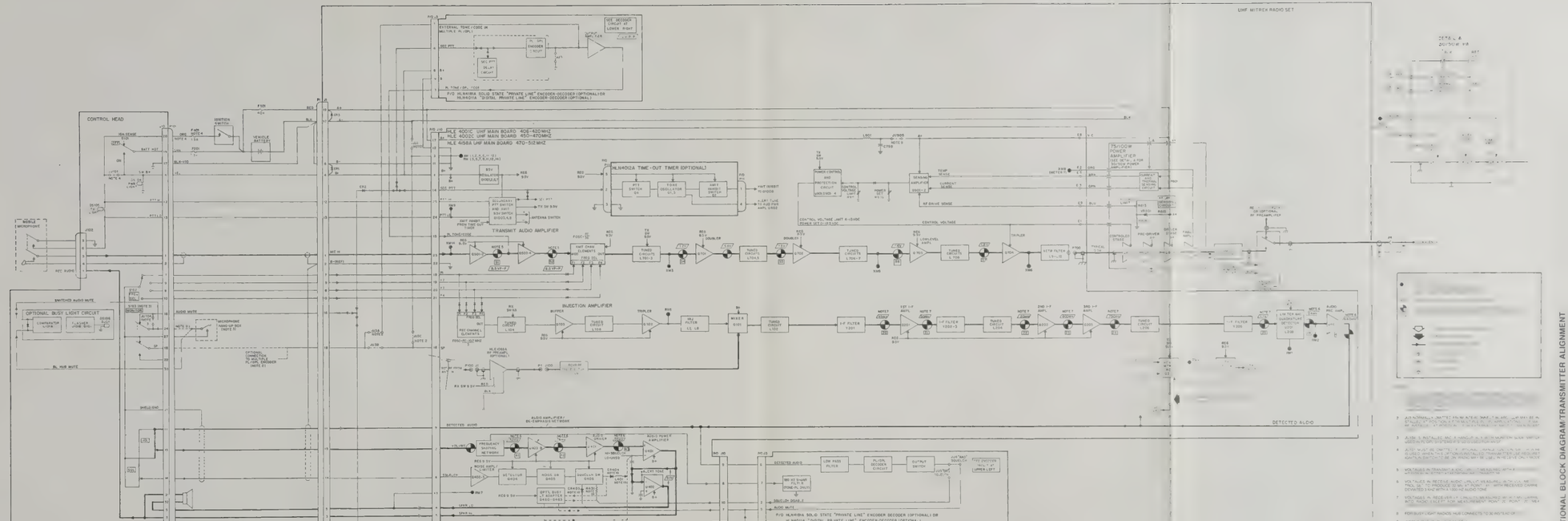
Step 4: For Private-Line or Digital Private-Line radios, disconnect the audio oscillator. On Private-Line radios adjust R23 on the PL board to set PL DEV to 700 Hz. No deviation adjustment is required for DPL radios. Private-Line or Digital Private-Line deviation should read 750 Hz ± 250 Hz. Reconnect the audio oscillator. Readjust DEV ADJ for 4.8 kHz on all transmit channels.

FINAL METER READINGS

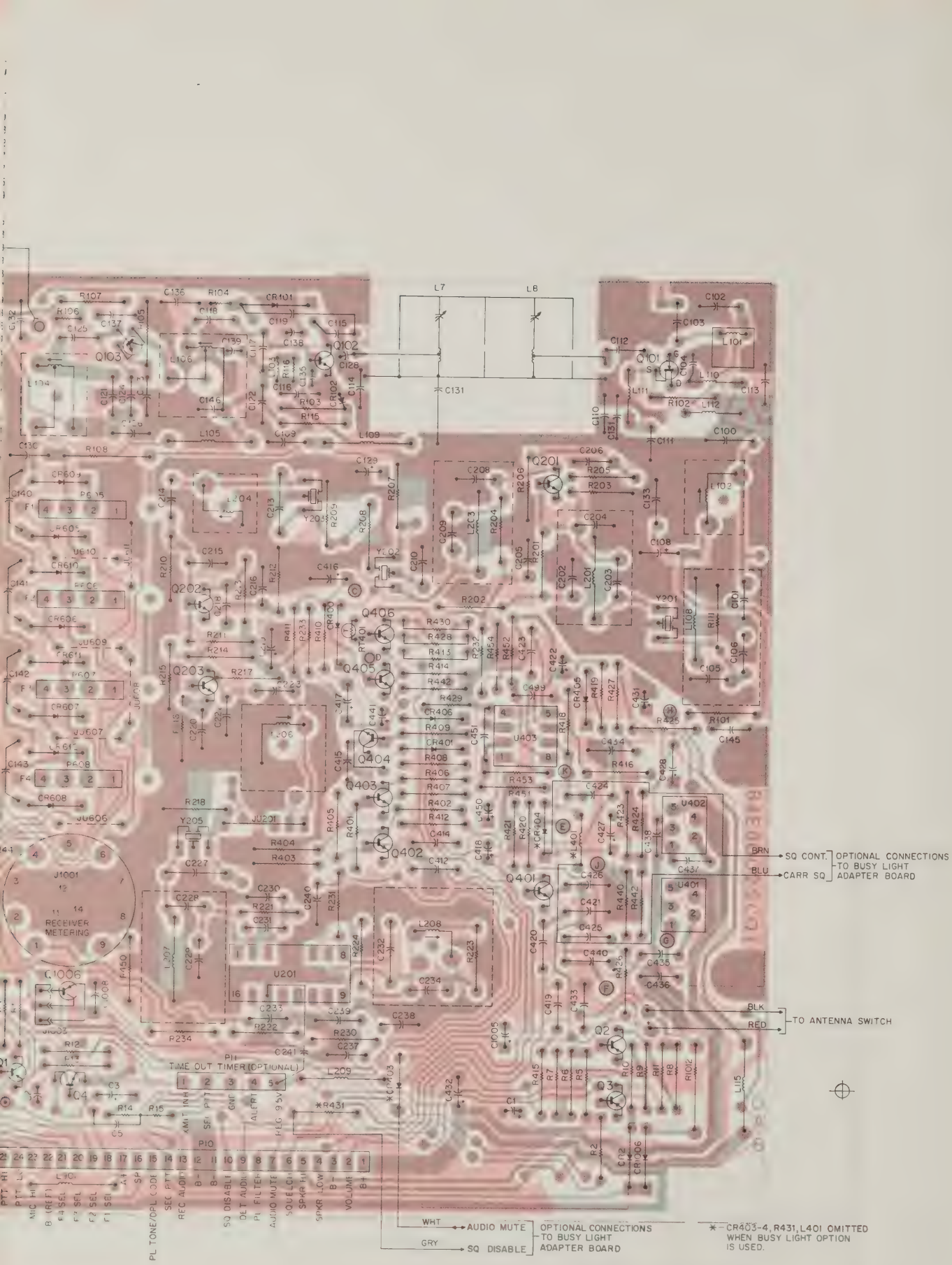
1. Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook.
2. The readings at M3 and M5 are purely relative and do not give actual current or voltage measurements.
3. Multiply the microampere scale reading obtained at M7 by 0.7 (30 W), 0.8 (50 W), or 1.1 (75/100 W) to determine the actual final amplifier current in amperes.

WHEN THE TRANSMITTER IS PROPERLY ALIGNED, METER DEFLECTIONS SHOULD FALL WITHIN THE LIMITS SHOWN IN TABLE BELOW.

	METER 3	METER 5	METER 6	METER 7
METER READINGS	15 (min) 50 (max)	10 (min) 50 (max)	6 (min) 50 (max)	17 (max) 50 W or 100 W radios) 13 (max) 75 W radios)
FUNCTION METERED	Base of First Doubler	Base of Low Level Ampl	Input of Exciter Filter	Final Ampl Current



FUNCTIONAL BLOCK DIAGRAM TRANSMITTER ALIGNMENT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Q201
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TONE "PRIVATE-LINE" ENCODER/DECODER

MODEL HLN4181A

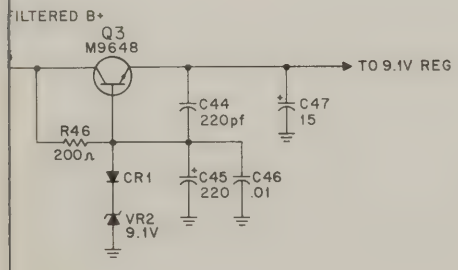
FUNCTION

Encodes and decodes sub-audible "Private-Line" tones. Encoder modulates transmitter and delays transmitter turn-off 150 ms to allow transmission of turn-off reverse tone burst. Decoder detects received tone and unsquelches receiver when proper tone is received.

NOTES:

1. Components within dashed area form an input filter for decode tone derived from detected audio
2. All capacitor values are in μF unless otherwise stated.
3. Theory information
4. Signal flow.

CAUTION
Make certain that NO power is supplied to the radio when inserting or removing the PLED circuit board. Damage to the PLED or external test equipment may result.



EEPW0081-O

UHF "MITREK" RADIO

TRANSMITTER SECTION BOARD DETAIL

Reference Series Key

REFERENCE	CIRCUIT
0-99	Receiver Meter 4, Receiver 9.5 V Switch
100-199	Receiver Injection and Receiver rf
200-299	IF
300-399	—
400-459	Detector, Receiver Audio, Squelch
460-480	Busy Light Adapter
500-599	Transmit Audio
600-699	Transmit and Receive Channel Elements
700-799	Exciter
800-899	Power Amplifier
900-999	Power Control and Protection
1000-1099	Regulator, Transmitter 9.5 V Switch, PTT

68P81039E21-D
(Sheet 1 of 5)
GGI 9-23-83

parts list

LEGEND
L = 406-420 MHz
H = 450-512 MHz

P/O HLE4001C UHF Main Board, Transmitter Section (406-420 MHz)
P/O HLE4002C UHF Main Board, Transmitter Section (450-470 MHz)
P/O HLE4158A UHF Main Board, Transmitter Section (470-512 MHz) PL-6028-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: ± 5%; 500 V
C501	21-8359663	.01µF + 60, −40% 500 V
C502	21-8350E10	220 pF, ± 20%
C503, 504	8-8463TL31	.047 µF, ± 10%; 250 V
C505, 506	21-8359E10	220 pF, ± 20%
C507	8-8449B003	.01 µF, ± 10%; 250 V
C508	8-8290S040	.03 µF, 50 V
C509	8-8381-3144	.0012 µF, 100 V
C511	23-84665F03	100 µF + 100, −10%; 25 V
C802	21-8444B002	.01 µF, ± 20%; 100 V
C701H	21-83406B82	36 pF
C701L	21-84433B56	47 pF, ± 5% NPO; 500 V
C702H	21-82450B13	1.5 pF
C702L	21-82450B18	2 pF, ± 5%; 500 V
C703H	21-83406B86	47 pF
C703L	21-80067A54	56 pF, ± 5% NPO; 500 V
C704H	21-82450B13	1.5 pF
C704L	21-82450B18	2 pF, ± 5% NPO; 500 V
C705H	21-84433B23	120 pF
C705L	21-83798B17	100 pF, ± 5%, NPO; 200 V
C706H	21-84433B14	68 pF, 200 V
C706L	21-84493B11	100 pF, ± 5%, NPO; 200 V
C707	21-83596E13	.001 µF, ± 10%; 1000 V
C708	21-83596E13	.001 µF, ± 10%; 1000 V
C709	21-83406D30	4.7 pF, ± .25 pF
C710	21-83596E13	.001 µF, ± 10%; 1000 V
C711	21-83596E36	.01 µF + 80, −40%, 250 V
C712H	21-83406D93	16 pF
C712L	21-83406D67	22 pF, ± 5% NPO; 500 V
C713H	21-864518	1 pF
C713L	21-82450B08	1.2 pF, ± 5%; 500 V
C714H	21-83406D58	24 pF
C714L	21-83406D87	43 pF, ± 5% NPO; 500 V
C715H	21-80067A54	56 pF
C715L	21-83406D87	43 pF, ± 5% NPO; 500 V
C716, 717	21-83596E13	.001 µF, ± 10%; 1000 V
C718H	21-83406D94	9 pF, ± .5 pF
C718L	21-82204B41	13 pF, ± 5% NPO; 500 V
C719H	21-82450B48	0.75 pF
C719L	21-82450B47	1 pF, ± 5%; 500 V
C720H	21-80067A29	11 pF, ± .5 pF
C720L	21-83406D55	18 pF, ± 5% NPO; 500 V
C721H	21-83406D92	36 pF
C721L	21-84493B56	47 pF, ± 5% NPO; 500 V
C722	21-83596E13	.001 µF, ± 10%; 1000 V
C723	21-83406D52	2 pF
C724	21-83596E13	.001 µF, ± 10%; 1000 V
C725	21-82372C10	.05 µF, ± 20%; 25 V
C726H	21-83406D87	43 pF
C726L	21-83406D71	33 pF NPO
C727H	21-82204B41	13 pF
C727L	21-83406D87	43 pF, ± 5% NPO; 500 V
C728H	21-82204B74	24 pF
C728L	21-83406D71	33 pF NPO
C729	21-82877B24	220 pF, ± 10%;75 V
C730	21-83596E13	.001 µF, ± 10%; 1000 V
C731H	21-83406D63	6 pF, ± .25 pF
C731L	21-83406D84	6.8 pF, ± .25 pF NPO; 500 V
C737, 738	21-82372C10	.05 µF, ± 20%; 25 V
C743	21-83596E13	.001 µF, ± 10%; 1000 V
C744H	21-80067A35	15 pF
C744L	21-83406D55	18 pF, ± 5% NPO; 500 V
C747	21-82372C09	0.1 µF, + 80, − 20%; 25 V
C750	23-84538G14	1 µF, ± 10%; 35 V
C753	21-82187B48	.003 µF, ± 10%; 100 V
C755	21-83406D68	27 pF
C756	23-84665F01	10 µF, 25 V
C757	21-83596E13	.001 µF, ± 10%; 1000 V
C758		plated on circuit board
C759	21-82372C10	.05 µF, ± 20%; 25 V
C760	21-82187B45	470 pF, ± 20%; 25 V
C902, 907	21-82187B44	.001 µF, ± 10%; 100 V
C908	21-82187B48	.003 µF, ± 10%; 100 V
C909	21-82187B44	.001 µF, ± 10%; 100 V
C910	23-84538G04	15 µF, ± 20%; 20 V
C914	21-82187B44	.001 µF, ± 10%; 100 V
C915	23-84538G22	6.8 µF, ± 10%; 20 V
C917	21-82187B44	.001 µF, ± 10%; 100 V
C918, 919	21-82372C10	.05 µF, ± 20%; 25 V
C920	23-84538G04	15 µF, ± 20%; 20 V
C921	23-84538G05	10 µF, ± 20%; 15 V
C1004	21-83596E37	.01 µF + 70, −30%; 100 V
C1005	23-84665F02	15 µF + 100, −10%; 25 V
C1007	21-82372C10	.05 µF, ± 20%; 25 V
C1008	23-84665F03	100 µF + 100, −10%; 25 V
C1009	21-8441I63	.0015 µF, ± 25%; 250 V
C1010	21-83596E21	.01 µF + 80, −40%; 250 V
C1011	23-84665F03	100 µF, ± 20%; 35 V

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR601 thru 604	48-83654H01	**diode: (see note)** silicon
CR701	48-82466H13	silicon
CR702	48-82130G01	germanium
CR705	48-83654H01	silicon
CR706	48-82130G01	germanium
CR901, 905, 906	48-83654H01	silicon
CR902, 904, 907, 908, 909	48-82466H13	silicon
CR1001	48-83654H02	silicon
CR1003,1005	48-83654H01	silicon
CR1006	48-82466H13	silicon
J901	9-80028A01	**connector, receptacle:** female, 3-contact
J1002	9-80031C02	female, 12-contact
J1003	9-80028A01	female, 3-contact
L701	24-83377Q11	**coils:** 6½ turns (Violet)
L702, 703	24-83068A17	6 turns (Yellow)
L704	24-80068A18	4½ turns (Orange)
L705	24-80068A19	4½ turns (White)
L706	24-80034A02	3½ turns (White)
L707	24-80034A03	3½ turns (Red)
L708H	24-80034A03	3½ turns (Red)
L708L	24-80034A04	3½ turns (Red)
L710	24-82835G13	choke, 0.82 µH
L711	24-83077B02	choke, 2½ turns
L712	24-82835G13	choke, 0.82 µH
L713	24-83961B07	choke, 3½ turns
L714	24-82835G13	choke, 0.82 µH
L715	24-80026A02	choke, ½ turn; ferrite
L719H	10-5191	BARE WIRE
L716L	24-82723H25	.033 µH ± 5%
L717H	30-15268C37	22 ga. 0.38"
L717L	24-80066B02	coil, rf
L718H	24-8481A04	1½ turns
L718L	24-80066B01	coil, rf
L722, 723	24-82835G13	choke; 0.82 µH
L724, 725	24-80036A02	choke; ½ turn; ferrite
L901	24-82835G23	choke; 33 µH
P601 thru 604	28-80096A02	**connector, plug:** male; 5-contact
Q501	48-859543	**translator: (see note)** PNP; type M9543
Q502, 503	48-869642	NPN; type M9642
Q504	48-869643	PNP; type M9643
Q601	48-8494R4	NPN; type M8494
Q702	48-869638	NPN; type M9638
Q703	48-869657	NPN; type M9657
Q704	48-869887	NPN; type M9887
Q801	48-869652	field-effect; type M9652
Q902	48-869643	PNP; type M9643
Q903	48-869642	NPN; type M9642
Q904	48-84411L10	PNP; type M1110
Q1001, 1002	48-869642	NPN; type M9642
Q1003	48-869680	NPN; type M9680
Q1004	48-869643	PNP; type M9643
Q1006	48-84411L10	PNP; type M1110
Q1007	48-869642	NPN; type M9642
Q1008	48-869643	PNP; type M9643
R501	6-11009C43	**resistor, fixed: ± 10%; 1/4W;** unless otherwise stated 560
R502, 503	6-11009C83	27k
R504, 505	6-11009C13	33 ±5%
R506, 507	6-11009C93	68k
R508, 509	6-11009C73	10k
R510	6-11009C69	6.8k ± 5%
R511, 512	6-11009C79	7.5k ± 5%
R513	6-11009C32	200 ± 5%
R514	6-11009C01	10
R515	6-11009C38	360 ± 5%
R601	6-11009C65	4.7k
R702	6-11009C82	62k ± 5%
R703	6-11009C05	15
R704	6-11009C73	10k
R706H		not used
R706L	6-11009C25	100 ± 10%, ¼ W
R707	6-11009C17	47
R708	6-11009C73	10k
R709	6-11009C29	150; ½ W
R710H	6-11009C25	100 ± 5%
R710L	6-11009C21	68
R711H		not used
R711L	6-11009C49	1k
R712H		not used
R712L	6-11009C40	430
R713	17-8309B09	10 ± 5%; 2 W
R714	6-11009C49	1k ± 5%
R717	6-11009C17	47
R718	6-11009C25	100
R719	6-11009C90	51k ± 5%
R907	6-11009C81	22k
R908	6-11009C43	560
R909	18-80098B02	variable; 5k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R910	6-11009C81	22k
R911	18-80268B05	variable; 50k
R912	6-11009C83	27k ± 5%
R913	6-11009C72	9.1k ± 5%
R914	6-11009C97	100k ± 5%
R915	6-11009C27	120
R916, 917	6-11009C65	4.7k
R918	6-11009C39	390
R919	6-125C29	150, ½ W
R920	6-11009C25	100
R921	6-11009C43	560
R922	6-11009C49	1k
R924	6-11009C29	150
R926	6-11009C33	220 ± 5%
R927	6-11009C57	2.2k
R928	6-11009C50	2.7k
R1001	6-11009C53	1.5k
R1002	6-11009C22	75 ± 5%
R1003	6-11009C19	56 ± 5%
R1004	6-11009C53	1.5k
R1005	6-11009C73	10k
R1006	6-11009C49	1k
R1007	6-11009C73	10k
R1012	6-125C03	12; ½ W
R1013	6-11009C49	1k
R1014	6-11009C73	10k
R1015, 1016	6-11009C67	5.6k
R1017	6-11009C39	390
U801	51-84621K70	**integrated circuit: (see note)** type M2170
VR904	48-82256C51	**voltage regulator:** Zener type, 5.1 V
VR1002	48-82256C44	Zener type, 7.5 V
VR1007	48-83461E18	Zener type, 18 V
		mechanical parts
	26-80021C01	CAN, coil for L701
	26-80021C01	CAN, coil for L702
	26-80021C01	CAN, coil for L703
	26-80021C01	CAN, coil for L704
	26-80021C01	CAN, coil for L705
	26-80039A01	CAN, coil for L706
	26-80039A01	CAN, coil for L707
	26-80039A01	CAN, coil for L708
	14-80061C01	INSULATOR for Q703, 704

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

note

HLE4105A, HLE4106A, and HLE4107A RF Decks and HLN4184A Antenna Switch are not field repairable, and replacements should be ordered as a unit. Mechanical parts for the rf deck are available (see Sheet 5 of this section).

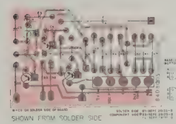
The harmonic filter is not field repairable, and replacements should be ordered by Motorola Kit Number: HFE4003A (406-420 MHz) or HFE4021A (450-512 MHz), both low power, or HFE4002A (406-420 MHz) or HFE4003A (450-512 MHz), both high power. For each harmonic filter ordered, order also one factory-formed wire, Motorola Part No. 30-80064A01

HLN4012A Time-Out Timer PL-6032-F

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	21-82372C10	**capacitor, fixed:** .05 µF + 80, −20%; 25 V
C2	23-83185D01	120 µF, ± 10%; 15 V
C3	8-84637L38	.0033 µF, ± 10%; 630 V
C4	23-84538G01	1 µF, ± 20%; 35 V
C5	8-84637L32	.0068 µF, ± 10%; 630 V
C6, 7	21-82696E10	220 pF, ± 20%; 500 V
C8	21-82187B44	.001 µF, ± 10%; 100 V
C9	21-83406D81	20 pF, ± 5%; 500 V
CR1, 2	48-83654H01	**diode: (see note)** silicon
P11	9-80088A01	**connector, receptacle:** female, 5-contact
Q1	48-869673	**translator: (see note)** Thyristor, type M9673
Q2	48-869467	PNP; type M9467
Q3, 4	48-869642	NPN; type M9642
R1	6-11009C71	**resistor, fixed: ± 10%, ¼ W;** unless otherwise stated 8.2k
R2	6-11009D11	360k ± 5%
R3	6-11009C89	47k ± 5%
R4	6-11009C97	100k ± 5%
R5	6-11009C53	1.5k ± 5%
R6	6-11009C33	220
R7	6-11009C73	10k
R8	6-11009C61	3.3k ± 5%
R9	6-11009C77	15k
R10	6-11009C49	1k ± 5%

note: For optimum performance, order diodes, transistors, and integrated circuits by Motorola part numbers.

TIME-OUT TIMER



SHOWN FROM SOLDER SIDE

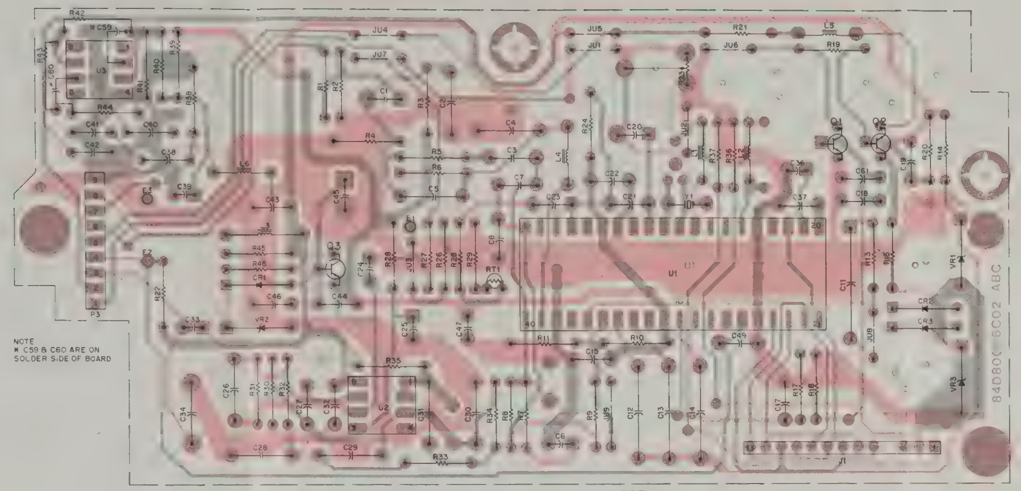
SHOWN FROM SOLDER SIDE

TONE "PRIVATE-LINE" ENCODER/DECODER

MODEL HLN4181A

FUNCTION

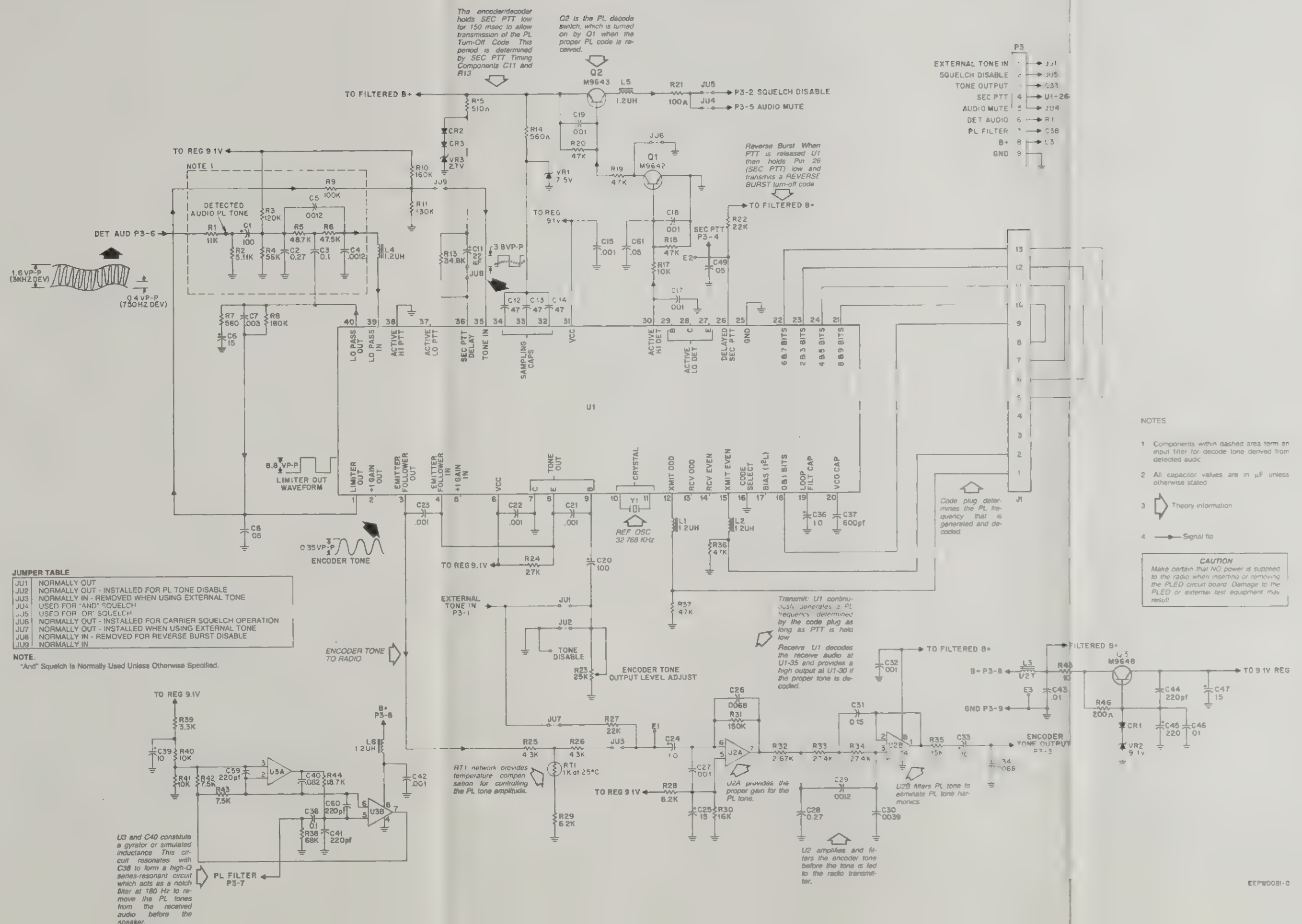
Encodes and decodes sub-audible "Private-Line" tones. Encoder modulates transmitter and delays transmitter turn-off 150 ms to allow transmission of turn-off reverse tone burst. Decoder detects received tone and unsquelches receiver when proper tone is received.



SHOWN FROM SOLDER SIDE

SOLDER SIDE

COMPONENT SIDE BD-DEPW-0107-O
SOLDER SIDE BD-DEPW-0108-O
OL-DEPW-0109-O



JUMPER TABLE

JU1	NORMALLY OUT
JU2	NORMALLY OUT - INSTALLED FOR PL TONE DISABLE
JU3	NORMALLY IN - REMOVED WHEN USING EXTERNAL TONE
JU4	USED FOR "AND" SQUELCH
JU5	USED FOR "OR" SQUELCH
JU6	NORMALLY OUT - INSTALLED FOR CARRIER SQUELCH OPERATION
JU7	NORMALLY OUT - INSTALLED WHEN USING EXTERNAL TONE
JU8	NORMALLY IN - REMOVED FOR REVERSE BURST DISABLE
JU9	NORMALLY IN

NOTE.
"And" Squelch Is Normally Used Unless Otherwise Specified.

NOTES

1. Components within dashed area form an input filter for decode tone derived from detected audio.
2. All capacitor values are in µF unless otherwise stated.
3. ⇨ Theory information
4. —►— Signal flo

CAUTION
Make certain that NO power is supplied to the radio when inserting or removing the PLED circuit board. Damage to the PLED or external test equipment may result.

EEPW0081-O

parts list

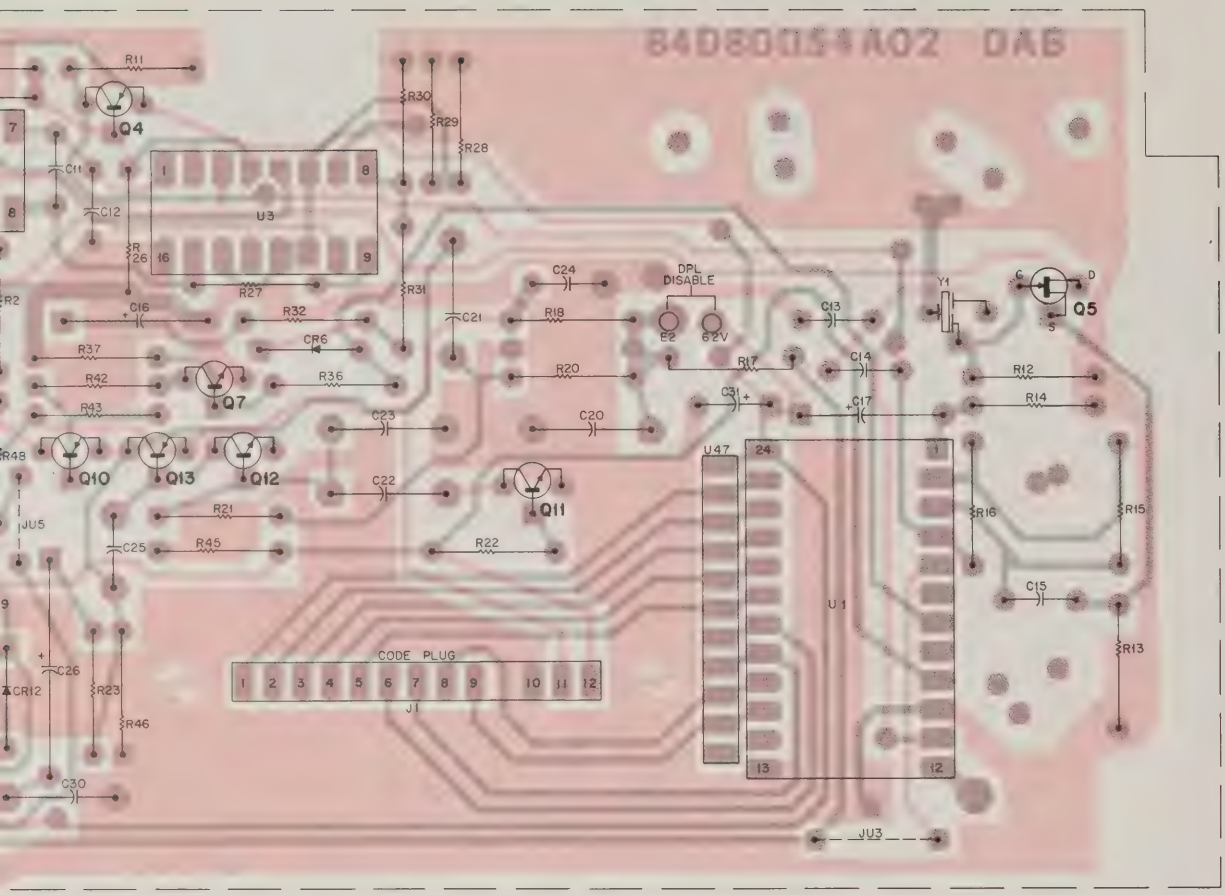
HLN4181A Code Plug PLED PLW-0049-O

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
		capacitors, fixed
C1	23-84665F03	electrolytic; 100 µF, 25 VDC
C2	08-84637L15	Mylar; 0.27 µF ±5%, 100 VDC
C3	08-84637L37	Mylar; 0.10 µF ±5%, 100 VDC
C4, C5	08-84637L03	Mylar; 0.0012 µF ±5%, 100 VDC
C6	23-84665F02	electrolytic; 15 µF, 25 VDC
C7	21-82187B16	ceramic disc; 0.003 µF ±10%, 100 V
C8	21-82372C10	ceramic disc; 0.05 µF ±20%, 25 V
C9, C10	—	not used
C11	23-84762H16	tantalum; 22 µF, 20 V
C12 - C14	08-84637L42	Mylar; 0.47 µF ±10%, 100 V
C15 - C19	21-82187B44	ceramic disc; 0.001 µF ±10%, 100 V
C20	23-84665F03	electrolytic; 100 µF, 25 VDC
C21 - C23	21-82187B44	ceramic disc; 0.001 µF ±10%, 100 V
C24	23-84665F04	electrolytic; 1 µF, 50 VDC
C25	23-84665F02	electrolytic; 15 µF, 25 VDC
C26	08-84637L06	Mylar; 0.0068 µF ±5%, 630 VDC
C27	21-82187B44	ceramic disc; 0.001 µF ±10%, 100 V
C28	08-84637L15	Mylar; 0.27 µF ±5%, 100 V
C29	08-84637L03	Mylar; 0.0012 µF ±5%, 1000 V
C30	08-84637L05	Mylar; 0.0039 µF ±5%, 630 V
C31	08-84637L01	Mylar; 0.15 µF ±5%, 100 V
C32	21-82187B44	ceramic disc; 0.001 µF ±10%, 100 V
C33	23-84665F01	electrolytic; 10 µF ±10%, 25 VDC
C34	08-83813H38	Mylar; 0.006 µF ±10%, 100 V
C35	—	not used
C36	23-84538G01	tantalum; 1 µF ±20%, 35 V
C37	21-00851299	ceramic disc; 600 pF ±10%
C38	08-84637L37	Mylar; 0.1 µF ±5%, 100 V
C39	23-84665F01	electrolytic; 10 µF ±10%, 25 VDC
C40	08-84637L36	Mylar; 0.082 µF ±5%, 100 V
C41	21-83596E10	ceramic disc; 220 pF ±20%, 500 V

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C42	21-82187B44	ceramic disc; 0.001 µF ±10%, 100 V
C43	21-83596E36	ceramic disc; 0.01 µF +60, −40%, 250 V
C44	21-83596E10	ceramic disc; 220 pF ±20%, 500 V
C45	23-84665F14	electrolytic; 220 µF, 16 V
C46	21-83596E36	ceramic disc; 0.01 µF +60, −40%, 250 V
C47	23-84665F02	electrolytic; 15 µF, 25 VDC
C48	—	not used
C49	21-82372C10	ceramic disc; 0.05 µF ±20%, 25 V
C50 - C58	—	PROM version only
C59, C60	21-83596E10	ceramic disc; 220 pF ±20%, 500 V
C61	21-82372C10	ceramic disc; 0.05 µF ±20%, 25 V
C62	—	PROM version only
		resistor, fixed; ohms ±5%, ⅛ W: unless otherwise specified
R1	06-11009C74	11k
R2	06-10621C63	5110 ±1%, ⅛ W
R3	06-11009C99	120k
R4	06-11009C91	56k
R5	06-10621D58	48.7k ±1%, ⅛ W
R6	06-10621D57	47.5k ±1%, ⅛ W
R7	06-11009C43	560
R8	06-11009D04	180k
R9	06-11009C96	100k
R10	06-11009D02	160k
R11	06-11009C99	130k
R12	—	not used
R13	06-10621D44	34.8k ±1%, ⅛ W
R14	06-11009C43	560
R15	06-11009C42	510
R16	—	not used
R17	06-11009C73	10k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R18 - R20	06-11009C89	47k
R21	06-11009C25	100
R22	06-11009C81	22k
R23	18-84944C02	25k variable potentiometer
R24	06-11009C83	27k
R25, R26	06-11009C64	4.3k
R27	06-11009C81	22k
R28	06-11009C71	8.2k
R29	06-11009C68	6.2k
R30	06-11009C78	16k
R31	06-10621E06	150k ±1%, ⅛ W
R32	06-10621C36	2670 ±1%, ⅛ W
R33, R34	06-10621D34	27.4k ±1%, ⅛ W
R35	06-11009C77	15k
R36, R37	06-11009C89	47k
R38	06-11009C93	68k
R39	06-11009C61	3.3k
R40, R41	06-10621C91	10k ±1%, ⅛ W
R42, R43	06-10621C79	7500 ±1%, ⅛ W
R44	06-10621D18	18.7k ±1%, ⅛ W
R45	06-11009C01	10
R46	06-11009C32	200
R47 - 49	—	not used
R50 - 75	—	PROM version only
		thermistor:
RT1	06-83600K02	1k @ 25°C
		coil, choke:
L1, L2	24-82723H27	1.2 µH
L3	24-80036A02	½ turn, ferrite
L4 - L6	24-82723H27	1.2 µH

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		transistor
Q1	48-00869642	type M9642, NPN
Q2	48-00869643	type M9643, PNP
Q3	48-00869648	type M9648, NPN
Q50 - Q56	—	PROM version only
		jumper:
JU3, JU4	10-00000518	22 sol tnd
JU8	10-00000518	22 sol tnd
		diode:
CR1	48-83654H01	silicon
CR2, CR3	48-83329G04	silicon reference
VR1	48-82256C44	zener, 7.5 V, 400 mW
VR2	48-82256C38	zener, 9.1 V, 400 mW
VR3	48-82256C33	zener, 2.7 V, 400 mW
CR50 - 57		PROM version only
		integrated circuit.
U1	51-83977M17	M7717 encoder/decoder
U2, U3	51-80067C03	M2176 op amp
U50	—	PROM version only
		crystal:
Y1	48-80055C01	crystal tuning fork
		miscellaneous:
P3	28-80073A02	9-pin molex
	09-80269B04	40-pin IC socket (U1)
J1	09-82071K01	code plug socket, 13-pin



SHOWN FROM SOLDER SIDE

COMPONENT SIDE BD-DEPW-0082-0
SOLDER SIDE BD-DEPW-0083-0
OL-DEPS-26098-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		transistor (see note):
Q1	48-869648	NPN; type M9648
Q2	48-869642	NPN; type M9642
Q3, 4	48-869643	PNP; type M9643
Q5	48-869653	FET; type M9653
Q6	48-869643	PNP; type M9643
Q7	48-869642	NPN; type M9642
Q8	48-869568	NPN; type M9568
Q9, 10	48-869643	PNP; type M9643
Q11, 12	48-869642	NPN; type M9642
Q13	48-869643	NPN; type M9643
		resistor, fixed (±5%, ¼ W): unless otherwise stated
R1	6-11009C93	68k
R2	6-11009C99	120k
R3, 4, 5	6-10621D64	56.2k ±1%; ⅛ W
R6	6-11009C55	1.8k
R7, 8	6-11009C73	10k
R9	6-11009C59	2.7k
R10	6-11009C73	10k
R11	6-11009C83	27k
R12	6-11009D08	270k
R13	6-11009C77	15k
R14	6-11009C97	100k
R15	6-11009D04	180k
R16	6-11009D14	470k
R17	6-11009C91	56k
R18	6-11009C92	62k
R20, 21	6-11009C97	100k
R22	6-11009C75	12k
R23	6-11009C77	15k
R24, 25	6-11009C33	220 ohms
R26	6-11009C73	10k
R27	6-11009C89	47k
R28	6-10621D80	82.5k ±1%; ⅛ W
R29	6-11009D14	470k
R30	6-11009C95	82k
R31	6-11009C99	120k
R32	6-11009C95	82k
R33	6-11009C49	1k
R34	6-11009C93	68k
R35	6-11009C79	18k
R36	6-11009C99	120k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R37	6-11009C95	82k
R38	6-11009C89	47k
R39	6-11009D02	150k
R40	6-11009C73	10k
R41	6-11009C49	1k
R42, 43	6-11009C89	47k
R44	6-11009D08	270k
R45	6-11009C93	68k
R46	6-11009C49	1k
R48	6-11009C33	220 ohms
R49	6-11009C99	120k
		integrated circuit (see note):
U1	51-84267A82	type N6782
U2	51-84320A55	type LM565CN
U3	51-84320A79	type CA3096AE
U47	51-82142K02	resistor network
		voltage regulator (see note):
VR10	48-83696E07	Zener, 6.2 V
VR11	48-82256C11	Zener, 10 V
VR12	48-82256C51	Zener, 5.1 V
		crystal, resonator:
Y1	48082003K01	50 kHz
		mechanical parts
	14-861196	INSULATOR, transistor
	3-10904A02	SCREW, machine: M3.5 x 0.6 x 6
	3-10904A15	SCREW, machine: M3.5 x 0.6 x 13
	4-80149A01	WASHER, captive: 4 used
	29-10271A15	TERMINAL, pin: 2 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

MOTOROLA INC.
Communications Group

instruction manual revision

GENERAL

The attached General Safety Information sheet contains new important information. This revision consists of changes that have occurred since your instruction manuals were printed. Please correct your manuals accordingly.

INSTRUCTION MANUALS AFFECTED:

68P81045E65-O	*Mitrek* Two-Way FM Radio, 29.7–50 MHz, 60/100 Watts
68P81045E70-O	*Mitrek* Two-Way FM Radio, 136–174 MHz, 40/60/75/110 Watts
68P81045E75-A	*Mitrek* Two-Way FM Radio, 403–420 and 450–512 MHz, 30/50/75/100 Watts
68P81045E80-O	*Mitrek* Two-Way FM Radio, 806–825 Transmit, 851–870 Receive 12/35 Watts
68P80100W30-O	*Motrek* Two-Way FM Radio, 150.8–162 MHz, 35/55/100 Watts
68P80100W35-O	*Motrek* Two-Way FM Radio, 450–470 MHz, 30/45/90 Watts

REVISION DETAILS:

1. In Instruction Manual 68P81045E65-O, directly following Page viii, remove 68P81045E71-O and replace it with the attached 687P80200W01-B.

2. In Instruction Manual 68P81045E70-O, directly following Page viii, remove 68P81045E71-O and replace it with the attached 68P80200W01-B.

3. In Instruction Manual 68P81045E75-A, directly following Page viii, remove 68P80200W01-O and replace it with the attached 68P80200W01-B.

4. In Instruction Manual 68P81045E80-O, directly following Page viii, remove 68P81045E71-O and replace it with the attached 68P80200W01-B.

5. In Instruction Manual 68P80100W30-O, directly following Page viii, remove 68P80200W01-A and replace it with the attached 68P80200W01-B.

6. In Instruction Manual 68P80100W35-O, directly following Page vii, remove 68P80200W01-A and replace it with the attached 68P80200W01-B.

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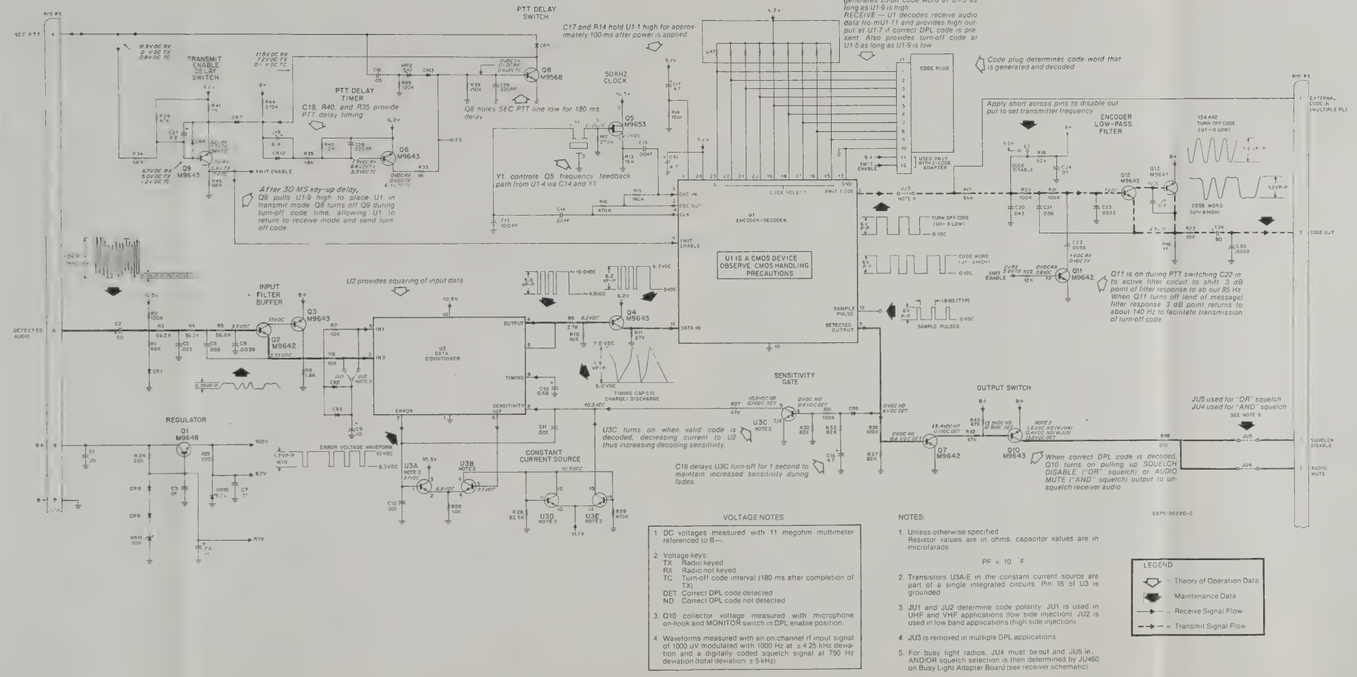
technical publication services
5555 North Beach Street, Fort Worth, Texas 76137
WMR-0129
5-22-84 GGI

DIGITAL PRIVATE–LINE
ENCODER/DECODER

MODEL HLN4011A

FUNCTION

Encodes and decodes *Digital Private-Line codes*. Encoder modulates transmitter and delays transmitter turn-off 150 ms to allow transmission of turn-off code. Decoder detects received tone and unsquelches receiver when proper code is received.



VOLTAGE NOTES

1. DC voltages measured with 11 megohm multi-meter referenced to B—.
2. Voltage keys:
   - TX Radio keyed
   - RX Radio not keyed
   - TC Turn-off code interval (180 ms after completion of TX)
   - DET Correct DPL code detected
   - ND Correct DPL code not detected
3. Q10 collector voltage measured with microphone on-hook and MONITOR switch in DPL enable position.
4. Waveforms measured with an on-channel rf input signal of 1000 uV modulated with 1000 Hz at ± 4.25 kHz deviation and a digitally coded squelch signal at 750 Hz deviation (total deviation ± 5 kHz)

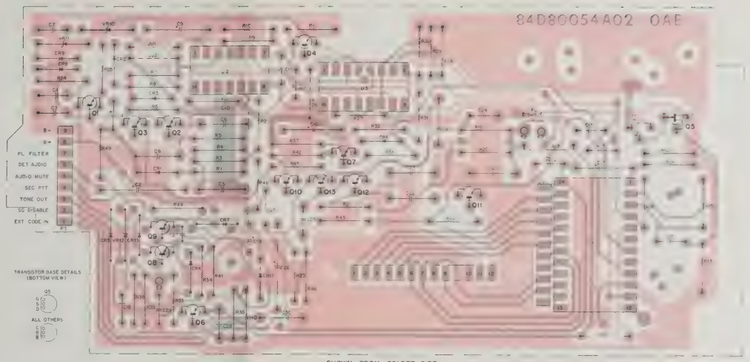
NOTES:

1. Unless otherwise specified
   Resistor values are in ohms; capacitor values are in microfarads

   $PF = 10^{-6} F$
2. Transistors U3A-E in the constant current source are part of a single integrated circuits Pin 16 of U3 is grounded
3. JU1 and JU2 determine code polarity. JU1 is used in UHF and VHF applications (low side injection) JU2 is used in low band applications (high side injection)
4. JU3 is removed in multiple DPL applications
5. For busy light radios, JU4 must be out and JU5 in. AND/OR squelch selection is then determined by JU460 on Busy Light Adapter Board (see receiver schematic)

EEPS-26290-E

LEGEND
- Theory of Operation Data
- Maintenance Data
- Receive Signal Flow
- Transmit Signal Flow



SHOWN FROM SOLDER SIDE

BO DENV 0082-O
BO DENV 0083-O
JL DENV 0629B-O

parts list

HLN4011A "Digital Private-Line" Encoder Decoder Board — FL-6050-F

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed (mF, ± 5%, 50 V): unless otherwise stated
C1	21-83596E36	.01 +60, -40%, 250 V
C2	23-84668A05	50 ±10%, 10 V
C3	21-83596E36	.01 +60, -40%, 250 V
C4	23-84538G04	15 ±20%, 20 V
C5	8-82905G39	.033
C6	8-83813H23	.068
C7	21-83596E36	.01 +60, -40%, 250 V
C8	8-83813H18	.0039
C9	23-84762H03	10 ±10% 20 V
C10	23-82783H48	68 ±5 V
C11, 12	21-82187B44	.001 ±10%, 100 V
C13	21-80017A65	100 pF 200 V
C14	21-80067A40	20 pF, 500 V
C15	21-83596E38	.0047 ±10%, 100 V
C16, 17	23-84762H07	4.7 ±20%, 10 V
C18	21-82372C10	.05 +20%, 25 V
C19	23-84538G52	6.8 ±10%, 20 V
C20	8-83813H14	.043
C21	8-83813H24	.039
C22	8-83813H26	.0056
C23	8-83813H27	.0033 100 V
C24	21-83596E36	.01 +60, -40%, 250 V
C25	21-82187B44	.001 +10%, 100 V
C26	23-84669A05	50 ±10%, 10 V
C27	23-84538G08	2.2 +20 -30%, 20 V
C28, 29	21-83596E10	220 pF +20%, 500 V
C30	8-84495D08	.0068 ±10%, 400 V
C31	23-84538G02	4.7 uF +20%, 20 V
		diode (see note):
CR1	48-83654H02	silicon
CR2, 3	48-84616A01	silicon, hot-carrier
CR4	48-83654H01	silicon
CR5	48-82468H13	rect silicon
CR6 thru 9, 12	48-83654H01	silicon
CR13	48-83654H01	silicon
		connector, receptacle:
J1	9-82071K01	female, 12-contact
		jumper:
JU1	7-84001A01	3-terminal
JU2	7-84001A02	3-terminal
JU3	7-84001A03	3-terminal
JU4	7-84001A04	3-terminal
JU5	7-84001A05	3-terminal

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		transistor (see note): unless otherwise stated
Q1	48-869648	NPN, type M9648
Q2	48-869642	NPN, type M9642
Q3, 4	48-869643	PNP, type M9643
Q5	48-869653	FET, type M9653
Q6	48-869643	PNP, type M9643
Q7	48-869642	NPN, type M9642
Q8	48-869568	NPN, type M9568
Q9, 10	48-869643	PNP, type M9643
Q11, 12	48-869642	NPN, type M9642
Q13	48-869643	NPN, type M9643
		resistor, fixed (±5%, ¼ W): unless otherwise stated
R1	6-11009C93	68k
R2	6-11009C99	120k
R3, 4, 5	6-10621D64	56.2k +1%, ⅛ W
R6	6-11009C55	1 Bk
R7, 8	6-11009C73	10k
R9	6-11009C59	2.7k
R10	6-11009C73	10k
R11	6-11009C83	27k
R12	6-11009D08	270k
R13	6-11009C77	15k
R14	6-11009C97	100k
R15	6-11009D04	180k
R16	6-11009D14	470k
R17	6-11009C91	56k
R18	6-11009C92	62k
R20, 21	6-11009C97	100k
R22	6-11009C75	12k
R23	6-11009C77	15k
R24, 25	6-11009C53	220 ohms
R26	6-11009C73	10k
R27	6-11009C89	47k
R28	6-10621D80	82.5k +1%, ⅛ W
R29	6-11009D14	470k
R30	6-11009C95	82k
R31	6-11009C99	120k
R32	6-11009C95	82k
R33	6-11009C49	1k
R34	6-11009C49	1k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R37	6-11009C95	82k
R38	6-11009C89	47k
R39	6-11009D02	150k
R40	6-11009C73	10k
R41	6-11009C49	1k
R42, 43	6-11009C89	47k
R44	6-11009D08	270k
R45	6-11009C93	68k
R46	6-11009C49	1k
R48	6-11009C33	220 ohms
R49	6-11009C99	120k
		integrated circuit (see note)
U1	51-84257A82	type M6782
U2	51-84320A55	type LM566CN
U3	51-84320A79	type CA3096AE
U47	51-82142H22	resistor network
		voltage regulator (see note)
VR10	48-83696E07	Zener, 8.2 V
VR11	48-82256C51	Zener, 10 V
VR12	48-82256C51	Zener, 5.1 V
		crystal; resonator
Y1	4808203K01	50 kHz
		mechanical parts
	14-86119K	INSULATOR: transistor
	3-11904A02	SCREW, machine: M3.5 x 0.6 x 8
	3-11904A15	SCREW, machine: M3.5 x 0.6 x 13
	4-80148A01	WASHER: captive, 4 used
	29-10271A15	TERMINAL, pin, 2 used

note: For optimum performance diodes, transistors and integrated circuits must be ordered by Motorola part numbers

68P81039E23-C
GGI 9-23-83

MOTOROLA INC.
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instruction manual revision

GENERAL

The attached General Safety Information sheet contains new important information. This revision consists of changes that have occurred since your instruction manuals were printed. Please correct your manuals accordingly.

INSTRUCTION MANUALS AFFECTED:

68P81045E65-O	*Mitrek* Two-Way FM Radio, 29.7–50 MHz, 60/100 Watts
68P81045E70-O	*Mitrek* Two-Way FM Radio, 136–174 MHz, 40/60/75/110 Watts
68P81045E75-A	*Mitrek* Two-Way FM Radio, 403–420 and 450–512 MHz, 30/50/75/100 Watts
68P81045E80-O	*Mitrek* Two-Way FM Radio, 806–825 Transmit, 851–870 Receive 12/35 Watts
68P80100W30-O	*Motrek* Two-Way FM Radio, 150.8–162 MHz, 35/55/100 Watts
68P80100W35-O	*Motrek* Two-Way FM Radio, 450–470 MHz, 30/45/90 Watts

REVISION DETAILS:

1. In Instruction Manual 68P81045E65-O, directly following Page viii, remove 68P81045E71-O and replace it with the attached 687P80200W01-B.

2. In Instruction Manual 68P81045E70-O, directly following Page viii, remove 68P81045E71-O and replace it with the attached 68P80200W01-B.

3. In Instruction Manual 68P81045E75-A, directly following Page viii, remove 68P80200W01-O and replace it with the attached 68P80200W01-B.

4. In Instruction Manual 68P81045E80-O, directly following Page viii, remove 68P81045E71-O and replace it with the attached 68P80200W01-B.

5. In Instruction Manual 68P80100W30-O, directly following Page viii, remove 68P80200W01-A and replace it with the attached 68P80200W01-B.

6. In Instruction Manual 68P80100W35-O, directly following Page vii, remove 68P80200W01-A and replace it with the attached 68P80200W01-B.

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WMR-0129
5-22-84 GGI

GENERAL SAFETY INFORMATION

The United States Department of Labor, through the provisions of the Occupational Safety and Health Act of 1970 (OSHA), has established an electromagnetic energy safety standard which applies to the use of this equipment. Proper use of this radio will result in exposure below the OSHA limit. The following precautions are recommended:

DO NOT operate the transmitter of a mobile radio when someone outside the vehicle is within two feet (0.6 meter) of the antenna.

DO NOT operate the transmitter of a fixed radio (base station, microwave, and rural telephone RF equipment) or marine radio when someone is within two feet (0.6 meter) of the antenna.

DO NOT operate the transmitter of any radio unless all RF connectors are secure and any open connectors are properly terminated.

In addition,

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.

All equipment must be properly grounded according to Motorola installation instructions for safe operation.

All equipment should be serviced only by a qualified technician.

Refer to the appropriate section of the product service manual for additional pertinent safety information.

WARNING

For vehicles equipped with electronic anti-skid braking systems, see "ANTI-SKID BRAKING PRECAUTIONS" Publication, Motorola Number 68P81109E34.

NOTE

See Page 2 for another important warning.

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68P80200W01-B

WARNING

It is mandatory that radio installations in vehicles fueled by liquefied petroleum gas conform to the following standard.

National Fire Protection Association standard NFPA 58 applies to radio installations in vehicles fueled by liquefied petroleum (LP) gas with the LP-gas container in the trunk or other sealed-off space within the interior of the vehicles. This standard requires that:

1. Any space containing radio equipment shall be isolated by a seal from the space in which the LP-gas container and its fittings are located.

2. Remote (outside) filling connections shall be used.

3. The container space shall be vented to the outside.

Installation Safety Warning

Consider the occupants' safety when you choose a location for the radio. Do not mount the radio overhead or on a sidewall unless you take special precautions.

If someone were to remove the radio and fail to latch it properly when replacing it, road shock could bump the radio loose, and the falling radio could in some circumstances cause serious injury to the driver or a passenger. In a crash, the radio, even when properly installed, could break loose and become a dangerous missile.

If you must mount the radio overhead or on a sidewall, give it the added protection of a retaining strap. Custom-made straps are available from Motorola National Parts. Order kit number HLN4698A (for *Mitrek*) or HLN4697A (for *SYNTOR* or *SYNTOR X*).

MOTOROLA INC.

Communications Group

instruction manual revision

Supersedes WMR-0091

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct the manual accordingly.

INSTRUCTION MANUALS AFFECTED:

68P80100W30-O	*Motrek* Two-Way FM Radio; 150.8 – 162 MHz; 35/55/100 Watts
68P80100W35-O	*Motrek* Two-Way FM Radio; 450 – 470 MHz; 30/45/90 Watts
68P81045E65-O	*Mitrek* Two-Way FM Radio; 29.7 – 50 MHz, 60/110 Watts
68P81045E70-O	*Mitrek* Two-Way FM Radio; 136 – 174 MHz, 40/60/75/110 Watts
68P81045E75-A	*Mitrek* Two-Way FM Radio; 406 – 420 MHz and 450 – 412 MHz, 30/50 Watts, 75/100 Watts
68P81045E80-O	*Mitrek* Two-Way FM Radio; 806 – 816 MHz Transmit, 851 – 861 MHz Receive, 12/35 Watts
68P81046E05-B	*Mitrek Plus* Two-Way FM Radio, Options B432 and B486

REVISION DETAILS:

1. In Instruction Manual **68P80100W30-O**:

   A. Page iv, Model Chart EPW-0045-O, change "HLN4044A" to "HLN4044B."

   B. Instruction Section **68P80100W06-O** (Sheet 3 of 5), substitute Parts List PL-6030-F, attached, for Parts List PL-6030-E.

   C. Instruction Section **68P80100W06-O** (Sheet 4 of 5), Diagram EEPW-0085-O, the interconnect board section, change the title "HLN4044A INTERCONNECT BOARD" to "HLN4044A,B INTERCONNECT BOARDS."

2. In Instruction Manual **68P80100W35-O**:

   A. Page iv, Model Chart EPW-0049-O, change "HLN4044A" to "HLN4044B."

   B. Instruction Section **68P80100W04-O** (Sheet 3 of 5), substitute Parts List PL-6030-F, attached, for Parts List PL-6030-E.

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WMR-0095
4-16-84 GGI

3. In Instruction Manual **68P81045E65-O**:

   A. Page iii, Model Chart EPS-30272-O, change "HLN4044A" to "HLN4044B."

   B. Instruction Section **68P81039E33-C** (Sheet 1 of 5), replace Parts List PL-6030-E with PL-6030-F (attached).

   C. Instruction Section **68P81039E33-C** (Sheet 2 of 5), Diagram EEPS-27788-A, the interconnect board section, change the title "HLN4044A INTERCONNECT BOARD" to "HLN4044A,B INTERCONNECT BOARDS."

4. In Instruction Manual **68P81045E70-O**:

   A. Page iv, Model Chart EPS-29766-O, change "HLN4044A" to "HLN4044B."

   B. Instruction Section **68P81039E29-C/D** (Sheet 3 of 5), replace Parts List PL-6030-E with PL-6030-F (attached).

   C. Instruction Section **68P81039E29-C** (Sheet 4 of 5), Diagram EEPS-26056-C, the interconnect board section, change the title "HLN4044A INTERCONNECT BOARD" to "HLN4044A,B INTERCONNECT BOARDS."

5. In Instruction Manual **68P81045E75-A**:

   A. Page iv, Model Chart EPW-0032-O, change "HLN4044A" to "HLN4044B."

   B. Instruction Section **68P81039E21-D** (Sheet 3 of 5), replace Parts List PL-6030-E with PL-6030-F (attached).

6. In Instruction Manual **68P81045E80-O**:

   A. Page iii, Model Chart EPS-31266-A, change "HUF1001A" to "HUF1001B" and change "HUF1005A" to "HUF1005B."

   B. Page iv, Model Chart EPS-81287-O, make the following changes:

from	**to**
HUF1001A	HUF1001B
HUF1005A	HUF1005B
HUF1002A	HUF1002B
HUF1006A	HUF1006B
HLN4044A	HLN4192B

   C. Instruction Section **68P81046E88-O** (Sheet 6 of 8), Diagram EEPS-30058-A, change the title "HLN4044A INTERCONNECT BOARD" to "HLN4044A,B INTERCONNECT BOARDS."

7. In Instruction Manual **68P81046E05-B**:

A. Page 1, Section 2.2, *Table 3*, make the following changes:

from	to
HUE1073B	HUE1073C
HUE1074B	HUE1074C
HUE1083B	HUE1083C
HUE1084B	HUE1084C
HUE1116B	HUE1116C
HUE1094B	HUE1094C

Change all "HLN4192A" kit numbers to "HLN4192B."

B. Page 2, Section 2.3, *Table 4*, make the following changes:

from	to
HUD1053B	HUD1053C
HUD1054B	HUD1054C
HUD1063B	HUD1063C
HUD1064B	HUD1064C
HUD1074B	HUD1074C
HUD1082B	HUD1082C

Change all "HLN4192A" kit numbers to "HLN4192B."

C. Page 2, Section 2.4, *Table 5*, make the following changes:

from	to
HUB1043B	HUB1043C
HUB1044B	HUB1044C
HUB1053B	HUB1053C
HUB1054B	HUB1054C
HUB1063B	HUB1063C
HUB1064B	HUB1064C
HUB1073B	HUB1073C
HUB1074B	HUB1074C

Change all "HLN4192A" kit numbers to "HLN4192B."

D. Page 2, Section 3.1.3; Page 3, Section 3.2.3; and Page 4, Section 3.3.2: change "HLN4192A" to "HLN4192B" and "HLN4044A" to "HLN4044B," and change "(Motorola Part No. 23-83210A24 or 23-80167C01)" to "(Motorola Part No. 23-80167C02)."

E. *Table 8* and *Table 10* on Page 3, and *Table 11* on Page 4, U401 and U402, change "51-80274B01" to "51-80065C03" and change "type M7401" to "I.C. Audio."

F. Behind Page 5, insert the attached Parts List MXW-0411-O.

parts list

HLN4044B Interconnect Board — PL-6030-F

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C1, 2	23-83210A19	500 μF +100, -10%; 20 V
C3	23-84665F01	10 μF +100, -10%; 25 V
C11 – 29	21-84874K01	470 pF ±20%, 25 V (feedthru)
		diode (see note):
CR1	48-82525G19	silicon
CR2	48-83654H01	silicon
CR3	1-80701T74	silicon
CR4	48-82466H18	silicon
		connector, receptacle:
J1	1-80701T74	CONNECTOR, assembly; includes C11 – 29
J3	9-80159F02	female; 9-contact
J10	9-80159F03	female; 25-contact
		resistor, fixed:
R2	6-11009C65	1.8k ±10%; ¼ W
R4	6-11009C33	220 ±10%; ¼ W
		mechanical parts
	42-80088A01	CLIP, option

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number.

HLN4192B Interconnect Board — MXW-0411-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C1, 2	23-80167C02	1000 μF ±20%; 25 V
C3	23-82783B25	4.7 μF ±10%, 25 V
C11 – 29	21-84874K01	470 pF ±20%, 25 V (feedthru)
		diode (see note):
CR1	48-82525G19	silicon
CR2	48-83654H01	silicon
CR3	1-80701T74	silicon
CR4	48-82466H18	silicon
		connector, receptacle:
J1	1-80701T74	CONNECTOR, assembly; includes C11 – 29
J3	9-80159F02	female; 9-contact
J10	9-80159F03	female; 25-contact
		resistor, fixed:
R2	6-11009C65	1.8k ±10%; ¼ W
R4	6-11009C33	220 ±10%; ¼ W
		mechanical parts
	42-80088A01	CLIP, option

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number.

MOTOROLA INC.
Communications
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instruction manual revision

GENERAL

This revision consists of changes that have occurred since your instruction manual was printed. Please correct the manual accordingly.

INSTRUCTION MANUAL AFFECTED:

68P81045E75-A — *Mitrek* Two-Way FM Radio, 406 – 420 MHz and 450 – 512 MHz, 30/50/75/100 Watts

REVISION DETAILS:

In your manual, delete Page 9 and 68P81039E21-D (Sheets 1 through 5) and add the attached Page 9 and 68P81039E21-E (Sheets 1 through 5).

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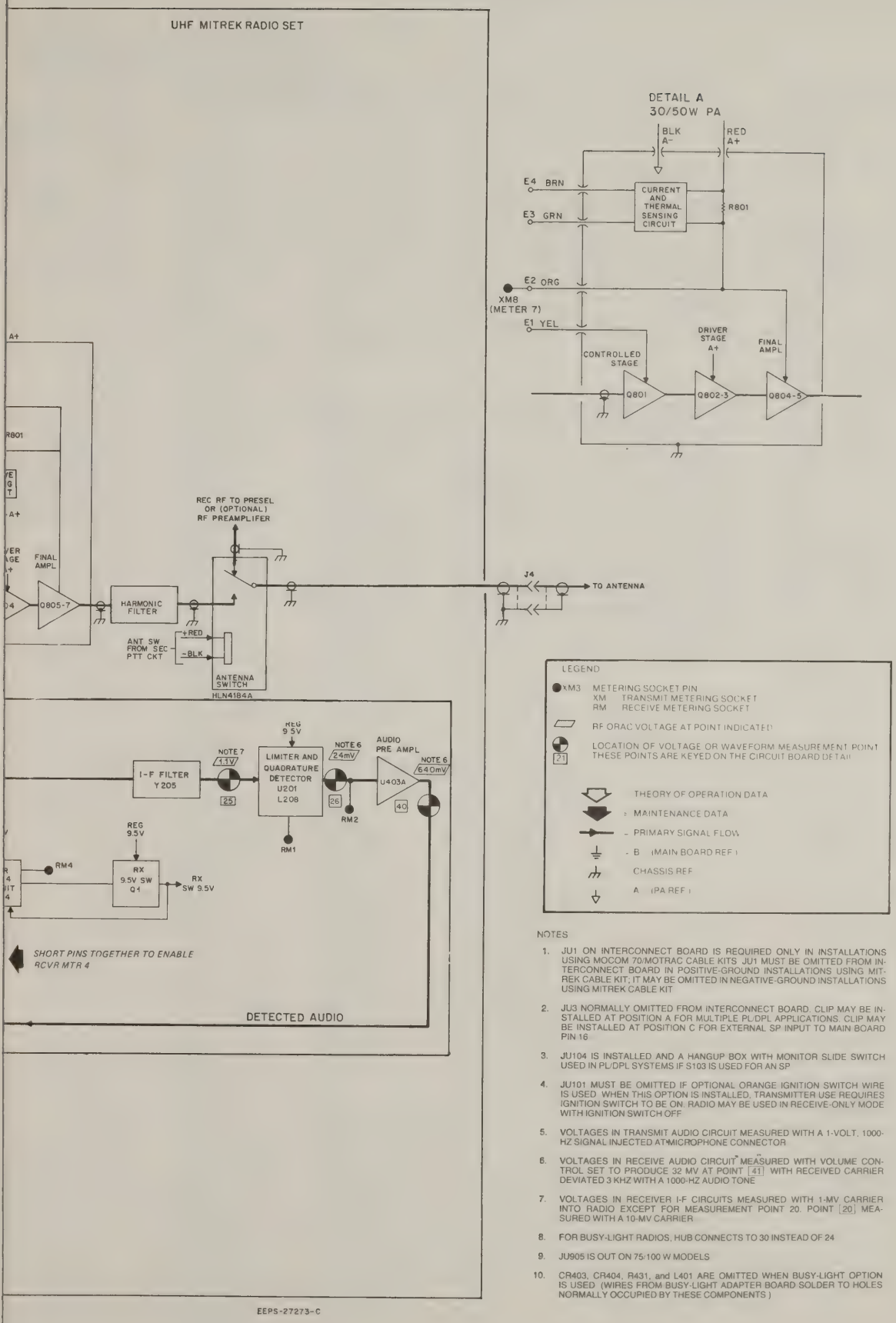
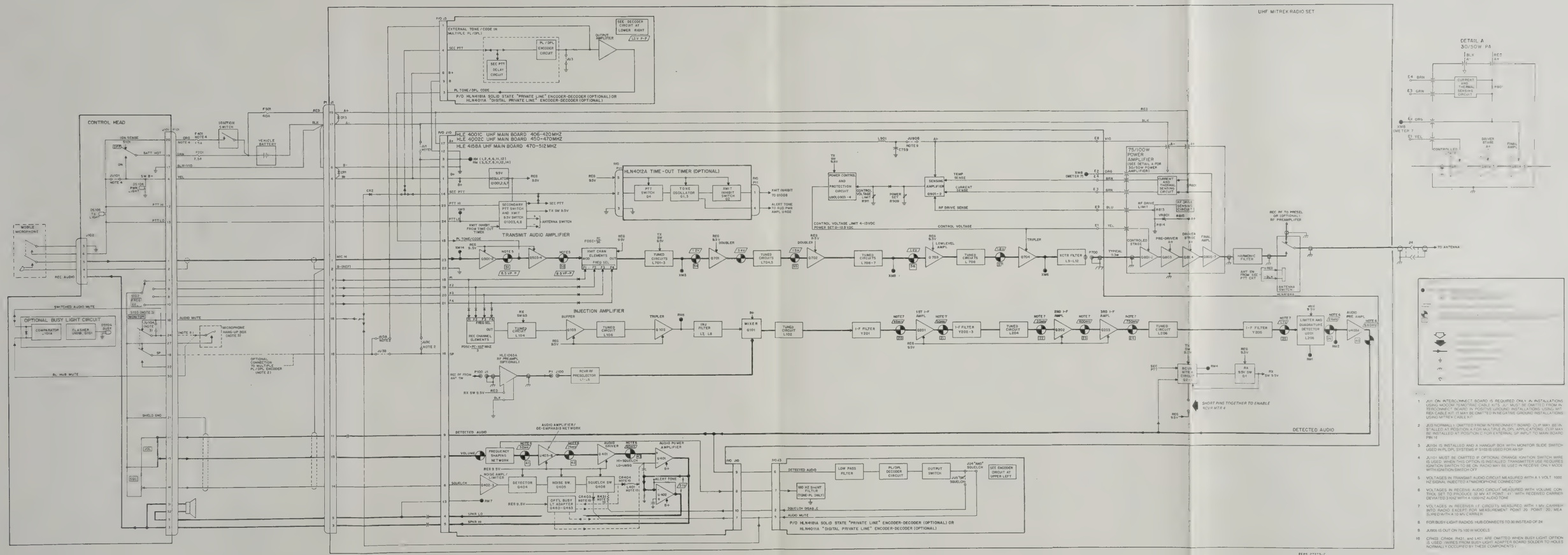
11/1/83



NOTES

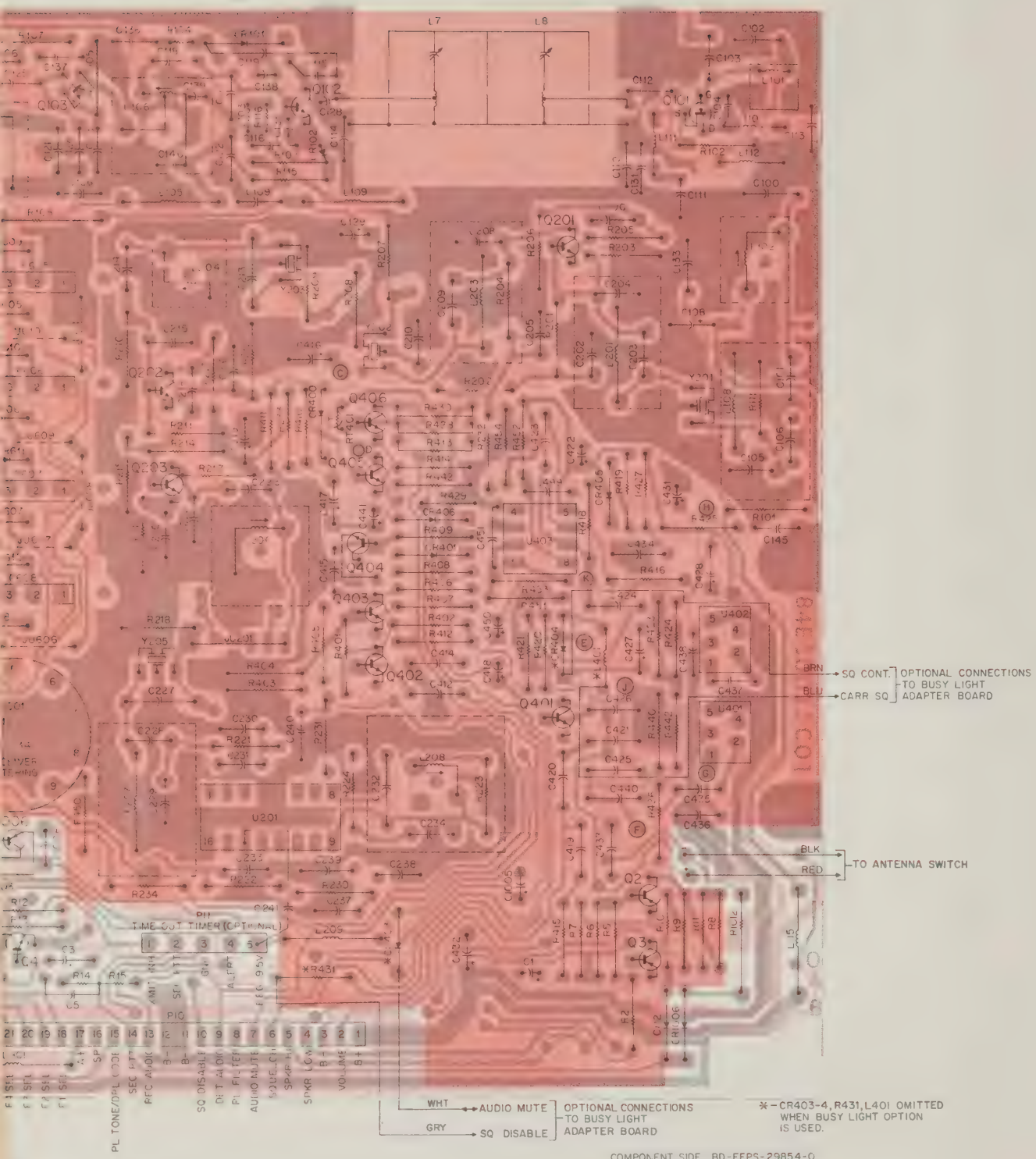
1. JU1 ON INTERCONNECT BOARD IS REQUIRED ONLY IN INSTALLATIONS USING MOCOM 70/MOTRAC CABLE KITS. JU1 MUST BE OMITTED FROM INTERCONNECT BOARD IN POSITIVE-GROUND INSTALLATIONS USING MITREK CABLE KIT; IT MAY BE OMITTED IN NEGATIVE-GROUND INSTALLATIONS USING MITREK CABLE KIT.
2. JU3 NORMALLY OMITTED FROM INTERCONNECT BOARD. CLIP MAY BE INSTALLED AT POSITION A FOR MULTIPLE PL/DPL APPLICATIONS. CLIP MAY BE INSTALLED AT POSITION C FOR EXTERNAL SP. INPUT TO MAIN BOARD PIN 16.
3. JU104 IS INSTALLED AND A HANGUP BOX WITH MONITOR SLIDE SWITCH USED IN PL/DPL SYSTEMS IF S103 IS USED FOR AN SP.
4. JU101 MUST BE OMITTED IF OPTIONAL ORANGE IGNITION SWITCH WIRE IS USED. WHEN THIS OPTION IS INSTALLED, TRANSMITTER USE REQUIRES IGNITION SWITCH TO BE ON; RADIO MAY BE USED IN RECEIVE-ONLY MODE WITH IGNITION SWITCH OFF.
5. VOLTAGES IN TRANSMIT AUDIO CIRCUIT MEASURED WITH A 1-VOLT, 1000-HZ SIGNAL INJECTED AT MICROPHONE CONNECTOR.
6. VOLTAGES IN RECEIVE AUDIO CIRCUIT MEASURED WITH VOLUME CONTROL SET TO PRODUCE 32 MV AT POINT [41] WITH RECEIVED CARRIER DEVIATED 3 KHZ WITH A 1000-HZ AUDIO TONE.
7. VOLTAGES IN RECEIVER I-F CIRCUITS MEASURED WITH 1-MV CARRIER INTO RADIO EXCEPT FOR MEASUREMENT POINT 20. POINT [20] MEASURED WITH A 10-MV CARRIER.
8. FOR BUSY-LIGHT RADIOS, HUB CONNECTS TO 30 INSTEAD OF 24.
9. JU905 IS OUT ON 75-100 W MODELS.
10. CR403, CR404, R431, and L401 ARE OMITTED WHEN BUSY-LIGHT OPTION IS USED. (WIRES FROM BUSY-LIGHT ADAPTER BOARD SOLDER TO HOLES NORMALLY OCCUPIED BY THESE COMPONENTS.)

EEPS-27273-C



1. JU1 ON INTERCONNECT BOARD IS REQUIRED ONLY IN INSTALLATIONS USING MOCOM 70 MITRAC CABLE KITS. JU MUST BE OMITTED FROM INTERCONNECT BOARD IN POSITIVE GROUND INSTALLATIONS USING MITREK CABLE KIT. IT MAY BE OMITTED IN NEGATIVE GROUND INSTALLATIONS USING MITREK CABLE KIT.
2. JU3 NORMALLY OMITTED FROM INTERCONNECT BOARD. CLIP MAY BE INSTALLED AT POSITION A FOR MULTIPLE PL/DPL APPLICATIONS. CLIP MAY BE INSTALLED AT POSITION C FOR EXTERNAL SP INPUT TO MAIN BOARD PIN 16.
3. JU104 IS INSTALLED AND A HANGUP BOX WITH MONITOR SLIDE SWITCH USED IN PL/DPL SYSTEMS IF S103 IS USED FOR AN SP.
4. JU101 MUST BE OMITTED IF OPTIONAL ORANGE IGNITION SWITCH WIRE IS USED. WHEN THIS OPTION IS INSTALLED TRANSMITTER USE REQUIRES IGNITION SWITCH TO BE ON. RADIO MAY BE USED IN RECEIVE ONLY MODE WITH IGNITION SWITCH OFF.
5. VOLTAGES IN TRANSMIT AUDIO CIRCUIT MEASURED WITH A 1 VOLT 1000 HZ SIGNAL INJECTED X'MITTER MIC CONNECTOR.
6. VOLTAGES IN RECEIVE AUDIO CIRCUIT MEASURED WITH VOLUME CONTROL SET TO PRODUCE 32 MV AT POINT "41" WITH RECEIVED CARRIER DEVIATED 3.5KHZ WITH A 1000 HZ AUDIO TONE.
7. VOLTAGES IN RECEIVER I.F. CIRCUITS MEASURED WITH 1 MV CARRIER INTO RADIO EXCEPT FOR MEASUREMENT POINT 20. POINT 20 MEASURED WITH A 10 MV CARRIER.
8. FOR BUSY-LIGHT RADIOS: HUB CONNECTS TO 30 INSTEAD OF 24.
9. JU905 IS OUT ON 75-100 W MODELS.
10. CR403, CR404, R431, AND L401 ARE OMITTED WHEN BUSY LIGHT OPTION IS USED. (WIRES FROM BUSY-LIGHT ADAPTER BOARD SOLDER TO HOLES NORMALLY OCCUPIED BY THESE COMPONENTS.)

EEPS 27273-C



* – CR403-4, R431, L401 OMITTED WHEN BUSY LIGHT OPTION IS USED.

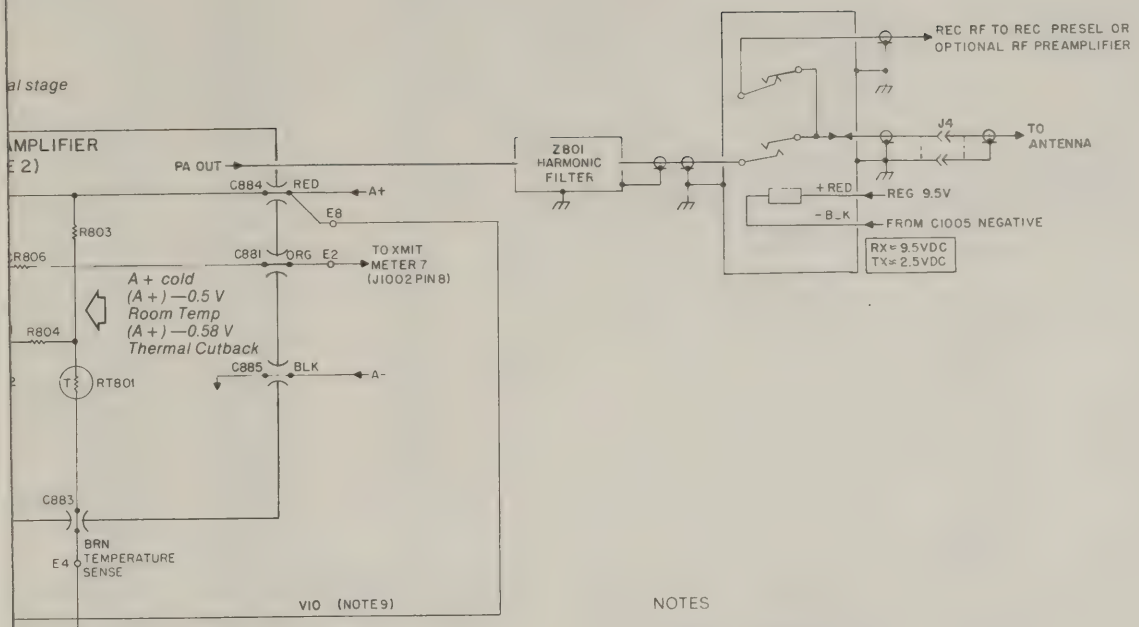
COMPONENT SIDE BD-EEPS-29854-O

SOLDER SIDE BD-EEPS-29855-O

OL-EEPS-27566-C

TVOL-EEPS-27567-B

FROM SOLDER SIDE



Q902 senses and maintains a constant current to the power amplifier final stages. RT801 senses PA temperature and causes rinal amplifier stage current to decrease above a given temperature to maintain the PA in a safe operating condition.

SQUARE PAD ON PC. BOARD INDICATES:
1. GATE OF FET
2. BASE OF TRANSISTOR
3. CATHODE OF DIODE
4. POSITIVE LEAD OF ELECTROLYTIC CAPACTORS

ID:
Theory of Operation Data
Maintenance Data
Primary Signal Flow
B- (Main Board Ref)
Chassis Ref.
A- (PA Ref)

NOTES

1. Unless otherwise indicated
Resistor values are in ohms. Capacitor values are in microfarads
2. Only the protection circuit portion of the power amplifier is shown on this diagram. See the applicable separate power amplifier schematic diagram for the complete circuit
3. Points shown as ① ②. etc are connected to the interconnect board for distribution to other points in the radio. See receiver schematic diagram for the actual connections
4. C758 is plated on circuit board
5. JU601-JU605 installed as required to bus 2 or more channel select lines to a single channel element when those channels use the same receive frequency
6. Frequency calculation: fo = fc/36
Where f_o = crystal frequency and
f_c = carrier frequency
7. JU905 is out on 75/100W models
8. Circuitry shown within dashed box is used in 75/100 W radios only.
9. Wires supplying A + and rf drive sense used in 75/100 W radios only.
10. Frequency range sensitive part. Indicated value is for 450-512 MHz. See parts list for the 403-420 MHz part values.

UHF *Mitrek* Radio

TRANSMITTER SECTION BOARD DETAIL

parts list

LEGEND
L = 406 – 420 MHz
H = 450 – 512 MHz

p/o HLE4001C UHF Main Board, Transmitter Section (406 – 420 MHz)
p/o HLE4002C UHF Main Board, Transmitter Section (450 – 470 MHz)
p/o HLE4158A UHF Main Board, Transmitter Section (470 – 512 MHz) PL-6028-F

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed, ±5%, 500 V unless otherwise stated
C501	21-83596E36	01 µF +80, –40%, 200 V
C502	21-83566E10	220 pF ±20%
C503, 504	8-84637L33	.047 µF ±10%, 250 V
C505, 506	21-83566E10	220 pF ±20%
C507	8-84496D03	.01 µF ±10%, 250 V
C508	8-84265G43	.02 µF, 50 V
C509	8-84810H44	.0012 µF, 100 V
C511	23-84666F09	100 µF +100, –10% 25 V
C602	21-84448K02	.01 µF ±20%, 100 V
C701H	21-84302C82	36 pF
C701L	21-84493B56	47 pF
C702H	21-82450B13	1.5 pF
C702L	21-82450B18	2 pF
C703H	21-83406D86	47 pF
C703L	21-83567A54	56 pF
C704H	21-82450B13	1.5 pF
C704L	21-82450B18	2 pF
C705H	21-84493B23	120 pF
C705L	21-82450B18	2 pF
C706H	21-84493B14	68 pF, 200 V
C706L	21-84493B11	100 pF, 200 V
C707, 708	21-83596E13	.001 µF ±10%, 1000 V
C709	21-83406D80	4.7 pF ±.25 pF
C710	21-83596E13	.001 µF ±10%, 1000 V
C711	21-83596E36	.01 µF +80, –40% 250 V
C712H	21-83406D93	15 pF
C712L	21-83406D67	22 pF
C713H	21-84213B	1 pF
C713L	21-82450B08	1.2 pF
C714H	21-83596D56	24 pF
C714L	21-83406D87	43 pF
C715H	21-80667A54	36 pF
C715L	21-83406D87	43 pF
C716, 717	21-83596E13	.001 µF ±10%, 1000 V
C718H	21-83406D94	9 pF ±.5 pF
C718L	21-82004B41	13 pF
C719H	21-82450B48	5.6 pF
C719L	21-82450B47	1 pF
C720H	21-80667A29	11 pF ±.5 pF
C720L	21-83406D55	16 pF
C721H	21-83406D92	36 pF
C721L	21-84493B56	47 pF
C722	21-83596E13	.001 µF ±10%, 1000 V
C723	21-83406D52	2 pF
C724	21-83596E13	.001 µF ±10%, 1000 V
C725	21-82372C10	.05 µF ±20%, 25 V
C726H	21-83406D87	43 pF
C726L	21-83406D71	33 pF
C727H	21-82004B41	13 pF
C727L	21-83406D87	43 pF
C728H	21-82204B74	24 pF
C728L	21-83406D71	33 pF
C729	21-82877B24	220 pF ±10% 75 V
C730	21-83596E13	.001 µF ±10%, 1000 V
C731H	21-83406D63	6 pF ± .25 pF
C731L	21-83406D84	6.8 pF ± .25 pF
C732, 733	21-82372C10	.05 µF ±20%, 25 V
C734	21-83596E13	.001 µF ±10%, 1000 V
C744H	21-80667A35	13 pF
C744L	21-83406D55	18 pF
C745	21-82372C09	.01 µF +80, –20% 25 V
C750	23-84538G14	1 µF ±10%, 35 V
C751	21-82187B48	.003 µF ±10%, 100 V
C752	21-83406D68	27 pF
C754	23-84665P01	10 µF 25 V
C757	21-83566E13	.001 µF ±10%, 1000 V
C758		plated on circuit board
C759	21-82372C10	.05 µF ±20%, 25 V
C902, 903	21-82187B44	.001 µF ±10%, 100 V
C906	21-82187B48	.003 µF ±10%, 100 V
C909	21-82187B44	.001 µF ±10%, 100 V
C910	23-84538G04	15 µF ±20%, 20 V
C914	23-84538G22	6.8 µF ±10%, 20 V
C915	23-84538G22	6.8 µF ±10%, 20 V
C917	21-82187B44	.001 µF ±10%, 100 V
C918, 919	21-82372C10	.05 µF ±20%, 25 V
C920	23-84538G04	15 µF ±20%, 20 V
C921	23-84538G05	10 µF ±20%, 15 V
C1004	21-83596E37	.01 µF +70, –30% 100 V
C1005	23-84665P02	15µF +100, – 10% 25 V
C1007	21-82372C10	.05 µF ±20% 25 V
C1008	23-84665P03	100 µF +100, – 10% 25 V
C1009	21-84476D	.0015 µF ± 25% 250 V
C1010	21-83596E37	.01 µF +80, – 40% 250 V
C1011	23-84665P03	100 µF ±20% 35 V

Reference Series Key

REFERENCE	CIRCUIT
0 – 99	Receiver Meter 4, Receiver 9.5 V Switch
100 – 199	Receiver Injection and Receiver RF
200 – 299	IF
300 – 399	—
400 – 459	Detector, Receiver Audio, Squelch
460 – 480	Busy Light Adapter
500 – 599	Transmit Audio
600 – 699	Transmit and Receive Channel Elements
700 – 799	Exciter
800 – 899	Power Amplifier
900 – 999	Power Control and Protection
1000 – 1099	Regulator, Transmitter 9.5 V Switch, PTT

PL-6028-F (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode (see note)
CR501 – 504	48-83654H01	silicon
CR701	48-82466H13	silicon
CR702	48-82139G01	germanium
CR705, 706	48-82139G01	germanium
CR901, 902	48-82466H13	silicon rectifier
CR905	48-82406H01	silicon
CR906 – 909	48-82466H13	silicon rectifier
CR1001	48-83654H02	silicon
CR1003, 1005	48-83654H01	silicon
CR1006	48-82466H13	silicon
		connector, receptacle
J901	9-80038A01	female, 3-contact
J1002	9-80031C02	female, 12-contact
J1003	9-80028A01	female, 3-contact
		coils
L701	24-83377D11	6½ turns, violet
L702 703	24-80068A17	6½ turns, yellow
L704	24-80068A18	4½turns, orange
L705	24-80068A18	4½ turns, white
L706	24-80034A02	3½ turns, white
L707	24-80034A03	3½ turns, red
L708H	24-80034A03	3½ turns, red
L708L	24-80034A04	3½ turns, red
L710	24-82835G13	choke, 0.82 µH
L711	24-83577B02	choke, 2½ turns
L712	24-82835G13	choke, 0.82 µH
L713	24-83961B07	choke, 3½ turns
L714	24-82835G13	choke, 0.82 µH
L715	24-80034A02	choke, ½ turn, ferrite
L716H	10-518	bare wire, 22 gauge
L716L	24-82729H25	.033 µH ±5%
L717H	30-10280C57	22 gauge, 0.38"
L717L	24-80066B02	coil, RF
L718H	24-84614A04	1½ turns
L718L	24-80066B01	coil, RF
L722, 723	24-82835G13	choke, 0.82 µH
L724, 725	24-80036A02	choke, ½ turn, ferrite
L901	24-82835G23	choke, 33 µH
		connector, plug
P601 604	28-80096A02	male, 5-contact
		transistor (see note)
Q501 503	48-869643	PNP, type M9643
Q502 503	48-869642	NPN, type M9642
Q504	48-869643	PNP, type M9643
Q701	48-869494	NPN, type M9494
Q702	48-869638	NPN, type M9638
Q703	48-869657	NPN, type M9657
Q704	48-869687	NPN, type M9687
Q901	48-869652	field-effect, type M9652
Q902	48-869643	PNP, type M9643
Q903	48-869642	NPN, type M9642
Q904	48-84411L10	PNP, type M1110
Q1001, 1002	48-869642	NPN, type M9642
Q1003	48-869680	NPN, type M9680
Q1004	48-869643	PNP, type M9643
Q1006	48-84411L10	PNP, type M1110
Q1007	48-869642	NPN, type M9642
Q1008	48-869643	PNP, type M9643
		resistor, fixed, ±5%, ¼ W unless otherwise stated
R501	6-11009C43	560
R502 503	6-11009C83	27k
R504 505	6-11009C13	33
R506 507	6-11009C93	68k
R508 509	6-11009C73	10k
R510	6-11009C49	1.5k
R511 512	6-11009C70	5.1k
R513	6-11009C32	200
R514	6-11009C01	10
R515	6-11009C38	360
R601	6-11009C65	4.7k
R602	6-11009C92	62k
R703	6-11009C05	15
R704	6-11009C73	10k
R706H	—	not used
R706L	6-11009C25	100
R707	6-11009C17	47
R708	6-11009C73	10k
R709	6-125C29	150 ±10% ½ W
R710H	6-11009C25	100
R710L	6-11009C21	68

PL-6028-F (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R711H	—	not used
R711L	6-11009C49	1k
R712H	—	not used
R712L	6-11009C40	430
R713	17-82036G08	10 ±5%, 2 W
R714	6-11009C49	1k
R717	6-11009C17	47
R718	6-11009C25	100
R719	6-11009C80	51k
R907	6-11009C31	220
R908	6-11009C43	560
R909	18-80268B02	variable, 5k
R910	6-11009C81	12k
R911	18-80268B05	variable, 50k
R912	6-11009C83	27k
R913	6-11009C72	9.1k
R914	6-11009C67	100k
R915	6-11009C27	120
R916, 917	6-11009C65	4.7k
R918	6-11009C39	390
R919	6-125C29	150 ±10% ½ W
R920	6-11009C25	100
R921	6-11009C43	560
R922	6-11009C49	1k
R924	6-11009C29	150
R926	6-11009C27	120
R927	6-11009C57	2.2k
R928	6-11009C69	2.7k
R1001	6-11009C53	1.5k
R1002	6-11009C22	75
R1003	6-11009C19	56
R1004	6-11009C65	4.7k
R1005	6-11009C81	3.3k
R1006	6-11009C49	1k
R1007	6-11009C73	10k
R1012	6-125C03	12 ±10% ½ W
R1013	6-11009C49	1k
R1014	6-11009C73	10k
R1015, 1016	6-11009C67	5.6k
R1017	6-11009C39	390
		integrated circuit (see note)
U901	51-84621K70	type M3170
		voltage regulator
VR904	48-82256C51	zener type, 5.1 V
VR1002	48-82256C44	zener type, 7.5 V
VR1007	48-83461E18	zener type, 18 V
		mechanical parts
	26-80021C01	coil can for L701
	26-80021C01	coil can for L702
	26-80021C01	coil can for L703
	26-80021C01	coil can for L704
	26-80021C01	coil can for L705
	26-80039A01	coil can for L706
	26-80039A01	coil can for L707
	26-80039A01	coil can for L708
	14-80001C01	insulator for Q703, 704

Notes:

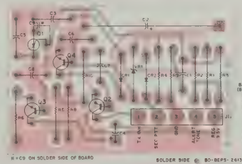
1. For best performance, order diodes, transistors, and integrated circuits by Motorola part number
2. The HLE4105A, HLE4106A, and HLE4107A RF Decks and the HLN4184A Antenna Switch are not field repairable, and replacements should be ordered as a unit. Mechanical parts for the RF deck are available (See Sheet 5 of this section.)
3. The harmonic filter is not field repairable, and replacements should be ordered by Motorola kit number HFE4002A (406 – 420 MHz) or HFE 4001A (450 – 512 MHz), both low power; or HFE 4002A (406 – 420 MHz) or HFE4003A (450 – 512 MHz), both high power. For each harmonic filter ordered, also order one factory-formed wire, Motorola part number 30-80064A01

HLN4012A Time-Out-Timer PL-6030-F

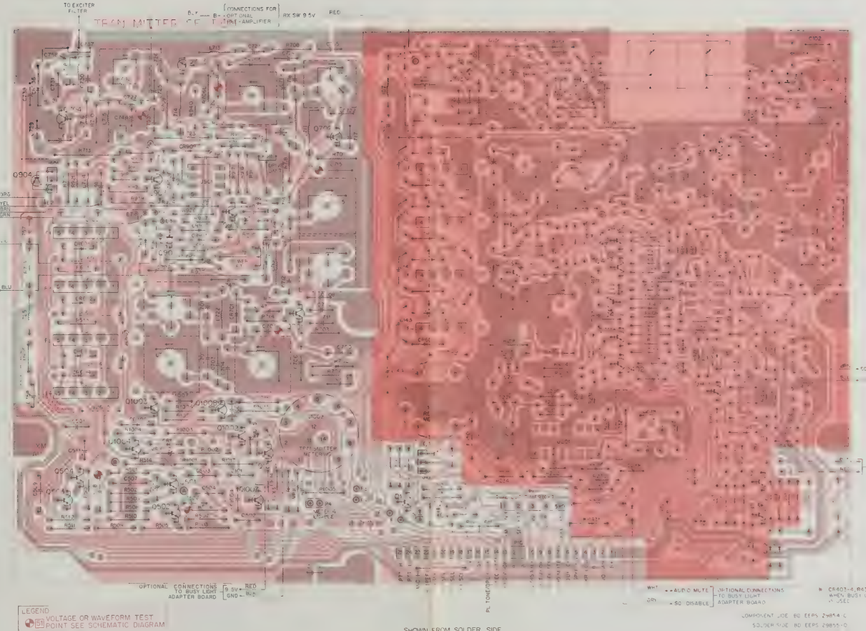
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed
C1	21-82372C10	.05 µF +80, –20%, 25 V
C2	23-83185D01	120 µF ±10%, 15 V
C3	8-84637L38	.0033 µF ±10%, 630 V
C4	23-84538G01	1 µF ±20%, 500 V
C5	8-84637L32	.0068 µF ±10%, 630 V
C6, 7	21-83596E10	220 pF ±20%, 35 V
C8	21-82187B44	.001 µF ±10%, 100 V
CR1, 2	48-83654H01	**diode (see note)** silicon
P11	9-80098A01	**connector, receptacle** female, 5-contact
Q1	48-869573	**transistor (see note)** thyristor, type M9573
Q2	48-869467	PNP, type M9467
Q3, 4	48-869642	NPN, type M9642
R1	6-11009C55	**resistor, fixed ±5%, ½ W** unless otherwise stated 1.8k
R2	6-11009D11	360k
R3	6-11009C69	47k
R4	6-11009C97	100k
R5	6-11009C53	1.5k
R6	6-11009C33	220
R8	6-11009C61	3.3k
R9	6-11009C77	15k
R10	6-11009C49	1k

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number

TIME-OUT TIMER



SHOWN FROM SOLDER SIDE



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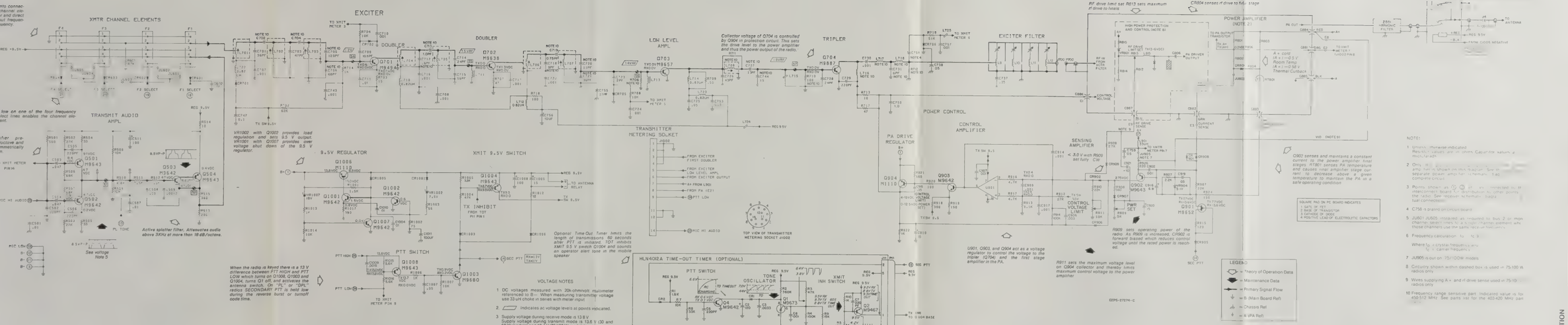
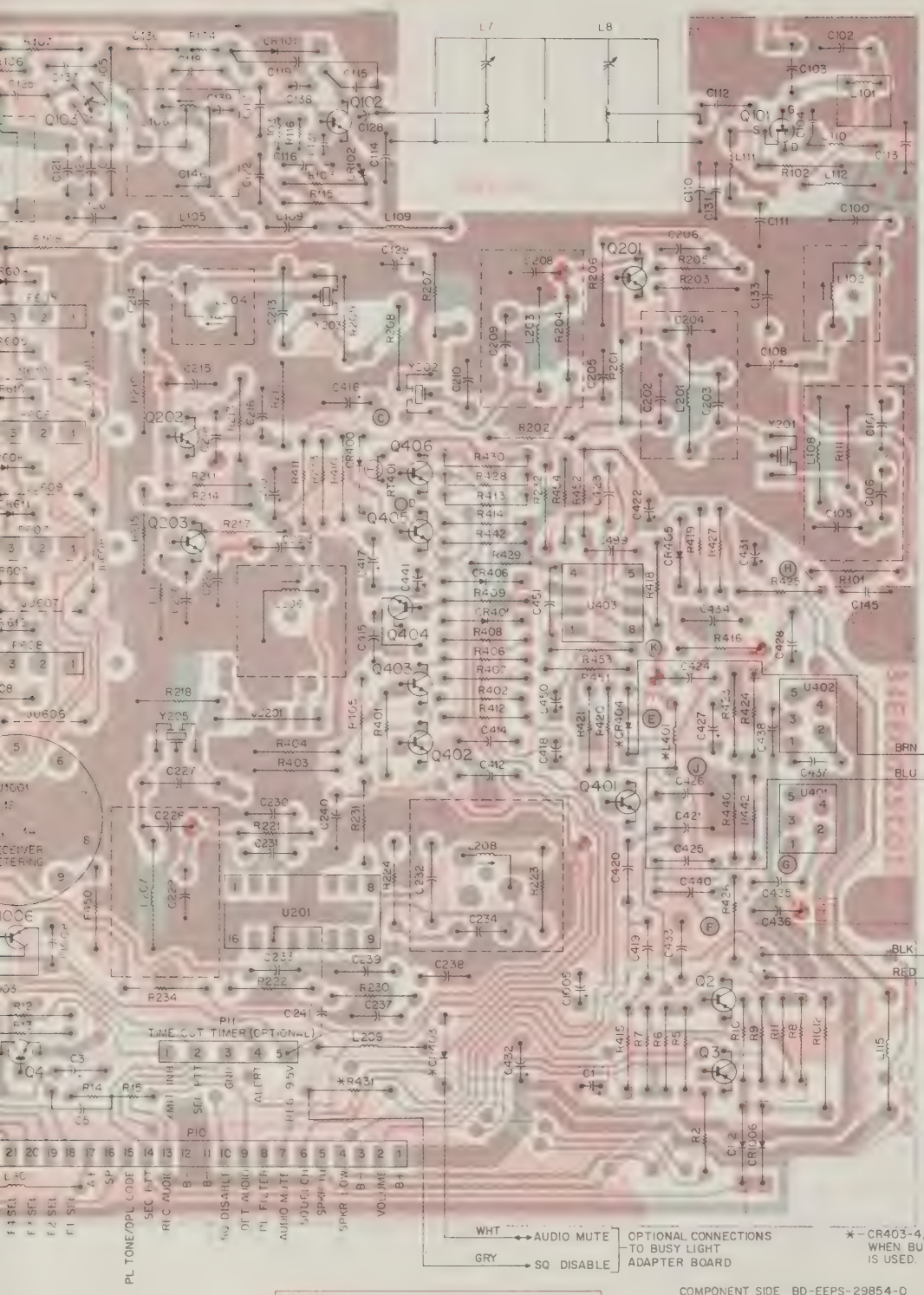


TRANSMITTER SECTION

RECEIVER SECTION



FROM SOLDER SIDE

LEGEND
(21) VOLTAGE OR WAVEFORM TEST POINT SEE SCHEMATIC DIAGRAM

* - CR403-4, R431, L401 OMITTED WHEN BUSY LIGHT OPTION IS USED.

COMPONENT SIDE BD-EEPS-29854-O
SOLDER SIDE BD-EEPS-29855-O
OL-EEPS-27566-C
PVOL-EEPS-27568-O

A low on fre
channel elen

IO TO SQUELCH
ONTROLS
CIRCUIT)

TECTOR (R222)

DIO PREAMP (R234)

TENDER (R308)

4
COL

ON FROM
AMPL (R155)

AUDIO

NOTES:

1. Unless otherwise specified, resistor values are in ohms and capacitor values are in microfarads.
   PF = 10^{-12} F
2. Points shown ①, ②, etc. are connected to interconnect board.
3. Frequency calculation: $F_{OSC} = F_C + 10.7$ MHz
4. JU301 used only for non-extender models.
5. Component values shown in ( ) are for range 1 only. See parts list.
6. JU611 installed in single-frequency radios to enable F1 channel elements. JU606 – JU610 installed as required to bus 2 or more channel-select lines to a single-channel element when those channels use the same receive frequency.
7. JU460 out for "AND" squelch, in for "OR" squelch. When busy light option is used:
   JU460 alone determines the type of squelch.
   JU1 on PL board or JU5 on DPL board must be in.
   JU2 on PL board or JU4 on DPL board must be out.
8. CR403, CR404, R431, and L401 are omitted when busy light option is used and wires from Busy Light Adapter Board solder to holes normally occupied by these components.
9. For "OR" squelch operation, Busy Light Option HLN4119A must be used
10. **R410 is used in HLB4001B and HLB4002B only.**

UIT PARAMETERS

	CONDITION	AUDIO MUTE ⑦	SQUELCH DISABLE ⑩	SQUELCH SWITCH EMITTER Q405	MUTE SWITCH COLLECTOR Q406
	NO CARRIER	6.8 V	1.2 V	1.2 – 3.5 V	1.5 – 5.0 V
	CARRIER PRESENT	6.8 V	0.8 V	0.0 V	0.2 V
	NO CARRIER	6.8 V	0.4 V	1.2 – 3.5 V	1.5 – 5.0 V
	CARRIER + PL OR DPL	PL 7.6 V DPL 12.3 V	0.8 V	0.0 V	0.2 V
	CARRIER W/O PL OR DPL	1.6 V	0.4 V	1.2 - 3.5 V	1.5 – 5.0 V
	RADIO KEYED	1.1 V	0.3 V	6.0 V	3.5 V
	NO CARRIER	TABLE B	TABLE B	1.2 – 3.5 V	4.5 V
9A	CARRIER PRESENT	TABLE B	TABLE B	0.0 V	0.2 V

CUIT PARAMETERS

	SQUELCH DISABLE ⑩	Q463 COLLECTOR	Q462 COLLECTOR	AUDIO MUTE ⑦
CARRIER	0 V	1.4 – 2 V**	9.4 V	1.4 – 2 V**
RRIER	0 V	5.9 – 8.8 V**	9.4 V	5.9 – 8.8 V**
CARRIER	0 V	1.4 – 2 V**	9.4 V	1.4 – 2 V**
RRIER	0 V	5.9 – 8.8 V**	9.4 V	5.9 – 8.8 V**
RRIER + PL	PL 8.1 V DPL 13.6 V	9.4 V	0.1 V	9.4 V

* See Note 9 for proper installation of PL/DPL jumpers when Busy Light Adapter HLN4119A is used.
** Voltage depends on whether or not JU460 is in or out, and if mic is on or off hook.

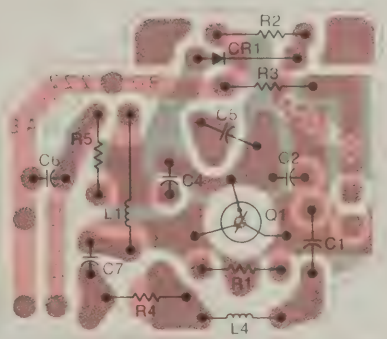
parts list

HLE1065A RF Preamplifier (406 – 512 MHz) PL-6889-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed, ±10%, 500 V unless otherwise stated
C1	21-82877B18	30 pF ±5%
C2	21-82877B17	5 pF ±5%
C4	21-83068E01	.01 µF, 12 V
C5	21-82877B18	30 pF ±5%
C6	21-83068E01	.02 µF, 12 V
C7	21-861603	3.3 pF ±0.25 pF
C8, 9	21-861219	1000 pF
		diode (see note)
CR1	48-84616A01	hot carrier
		choke
L1	24-82723H25	33 nH
L2 – 4	24-82723H04	0.29 µH
		transistor (see note)
Q1	48-869870	NPN, type M9870
		resistor, fixed ±10%, ⅛ W unless otherwise stated
R1	6-185A53	1.5k ±5%
R2	6-185B76	560
R3	6-185A21	68 ±5%
R4	6-185B67	100
R5	6-185A21	68 ±5%
		connector, receptacle
J1	9-83663C01	female phono receptacle
		connector, plug
P1	28-82331G01	male phone plug
		mechanical parts
	3-80255F02	metric tapping screw (B3.5 x 1.27 x 13), 2 used
	3-10936B15	metric tapping screw (TT2.5 x 45 x 6), 2 used
	4-83755H01	solder washer, 2 used
	15-80273B01	preamplifier housing
	64-80271B01	housing plate
	29-84706E02	crimp lug, 2 used
	9-84041D01	banana plug
	26-80034D01	shield
	43-82942L01	phono plug receptacle sleeve

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number.

RF PREAMPLIFIER



COMPONENT SIDE BD - BEPW - 0034 - 0
SOLDER SIDE BD - BEPW - 0035 - 0
OL - BEPW - 0036 - 0

UHF *Mitrek* Radio
RECEIVER SECTION BOARD DETAIL

parts list

LEGEND
L = 406 – 420 MHz
M = 450 – 470 MHz
H = 470 – 512 MHz

Receiver Section 406 – 420 MHz
Receiver Section 450 – 470 MHz
Receiver section 470 – 512 MHz

PL-6035-F

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed, µF ±5% 500 V unless otherwise stated
C1	23-84665F04	1 + 50, – 10%, 50 V
C2	23-84666F01	10 + 100, – 10%, 25 V
C3	23-84538G04	15 ±20%, 20 V
C5	21-82272C10	.05
C100	21-80067A27	10 pF
C101	21-82610C09	120 pF, 200 V
C102L	21-83406D82	36 pF
C102M, H	21-82272C10	.05 ±.25 V
C103L	21-80067A40	20 pF
C103M, H	21-82204803	6 pF
C104	21-82877B23	10 pF
C105	21-84193B34	17 pF
C106	21-82204840	3.6 pF
C108	23-84538G02	4.7 ±.20%, 20 V
C109	21-82187B44	001 ± 10%, 100 V
C110	21-82272C10	.05 ±.20%, 25 V
C111L, M	21-82187B44	001 ± 10%, 100 V
C111H	21-82272C10	.05 ±.20%, 25 V
C112L	21-80067A40	20
C112M, H	21-82204803	6 pF ± .5 pF
C113, 114	21-82272C10	.05 ±.20%, 25 V
C115L	21-83406D51	3.0 pF
C115M	21-83406D66	2.7 pF
C115H	21-83406D52	2.0 pF
C116L	21-83406D89	10 pF
C116M	21-83406D70	9 pF
C116H	21-82204803	6 pF
C117L, M	21-83406D65	3 pF
C117H	21-83406D52	2 pF
C118L	21-82204803	6 pF
C118M, H	21-83406D54	4.0 pF
C119L	21-82450B32	68 pF
C119M	21-82450B33	56 pF
C119H	21-82450B27	47 pF
C121L	21-82204B75	4 pF
C121M, H	21-82610C36	4.5 pF
C122	21-82187B44	001, 100 V
C123	21-82877B24	220 pF ± 10%
C124L	21-82204B41	13 pF
C124M, H	21-83406D84	6.8 pF ±2.5 pF
C125L	21-83406D76	3.9 pF
C125M, H	21-83406D52	2 pF
C126, 127	21-83699E36	.01 – 60, +20%
C128L, H	21-05311E20	6 pF
C128M	21-84713A46	7 pF
C129	23-84539G02	4.7 ±.20%, 20 V
C131	21-84483B41	100 pF ± 10%, 200 V
C132	21-82187B44	.001 ± 10%, 100 V
C133	21-82272C10	.05 ±.20%, 35 V
C139	21-84713A29	20 pF
C134M, H	21-83406D83	5.6 pF
C136, 137	21-84666B38	.004 ±.10%
C138	21-84193B34	17 pF
C140, 143	21-84484B42	10 pF
C141	21-84693B41	100 pF ± 10% 200 V
C142	21-82877B16	5 pF ± .25
C202	21-84193B32	15 pF
C204	21-84193B36	22 pF
C205, 206	21-84193B40	30 pF
C208	21-83406D68	27 pF
C209	21-83406D56	24 pF
C210	21-83406D60	30 pF

Q1, 2	48-869643	transistor (see note) PNP, type MSB43
Q4	48-869642	NPN, type M9642
Q5	48-869631	semiconductor, type M9631
Q100	48-8413D79	NPN, type HL29
Q101	48-869970	NPN, type M9932
Q201, 205	48-869644	NPN, type M9644
Q202, 403	48-869643	NPN, type M9642
Q404	48-13A674	NPN, type M54

P1	28-80181B04	**connector, plug** male, 2-contact
P10	28-80181B03	male, 25-contact
P11	28-80097A01	male, 5-contact
P605 – 608	28-80096A01	male, 4-contact

R1	6-11009C59	**resistor, fixed, ±5%, ½ W** unless otherwise stated 2.7k
R2	6-11009C91	56k
R3	6-11009C53	1.5k
R4	6-11009C65	4.7k
R5	6-11009C77	15k
R6	6-11009C81	22k
R7	6-11009C15	39
R8	6-11009C73	10k
R9	6-11009C77	15k
R10	6-11009C53	27k
R11	6-11009C41	470
R12	6-11009C77	15k
R13	6-11009C93	68k
R14, 15	6-11009C58	2.4k
R101	6-11009C25	100
R102	6-11009C43	560
R103	6-11009C65	4.7k
R104	6-11009C77	15k
R105	6-11009C24	91
R106	6-11009C46	680
R107	6-11009C27	2.2k
R108	6-125A19	56, ½ W
R111	6-11009C81	22k
R115M, H	6-11009C97	100k
R116	6-11009C73	10k
R201	6-11009C41	1k
R202	6-11009C79	18k
R203	6-11009C87	39k
R204	6-11009C27	330
R205	6-11009C09	22
R206	6-11009C59	2.7k
R207	6-11009C95	43k
R208	6-11009C45	680
R209	6-11009C89	43k
R210	6-11009C69	6.8k
R211	6-11009C63	5.6k
R212	6-11009C47	820
R213	6-11009C61	3.3k
R214	6-11009C83	27k
R215	6-11009C69	6.8k
R216	6-11009C47	820
R217	6-11009C61	3.3k
R218	6-11009C79	18k
R231	6-11009C56	2k
R232	6-11009C55	82k
R233	6-11009C83	27k
R234	6-11009C63	4.7k
R230	6-11009C49	1k
R231	6-11009C75	7.5k
R232	6-11009C21	68
R233	6-11009C13	33
R234	6-11009B06	220Ω
R401	6-11009C41	1k
R402	6-11009C69	6.8k
R403	6-11009C45	680
R404	6-11009C84	30k

PL-6035-F (3)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Q405	48-869642	NPN, type M9642
Q406	48-869528	NPN, type M9528
R405	6-11009C81	22k
R406	6-11009C73	10k
R407	6-11009C49	1k
R408	6-11009C57	2.2k
R409	6-11009C89	47k
R410	6-11009C57	2.2k
R411	6-11009C73	10k
R412	6-11009C72	9.1k
R413	6-11009C67	18k
R414	6-11009C29	150
R415	6-11009C73	10k
R416	6-11009C71	8.2k
R418	6-11009C97	100k
R419	6-11009C73	10k
R420, 421	6-11009C67	5.6k
R422	6-11009C42	510
R423, 424	6-11009C09	22
R425	6-11009C49	1k
R426, 427	6-80036G25	1.0
R428	6-11009C82	24k
R429	6-11009C68	8.2k
R430	6-11009C97	15k
R431	6-11009C80	33k
R440	6-11009C49	1k
R442	6-11009C93	68k
R443	6-11009C89	47k
R450	6-11009C73	10k
R451	6-11009C87	5.6k
R452	6-11009C81	3.3k
R453	6-11009C02	150k
R454	6-11009C67	5.6k
RT401	6 8360K06	**thermistor** 20k ±10% @25°C
U201	51-80069C03	**integrated circuit (see note)** type 69C03
U401, 402	51-80065C04	type 65C04
U403	51-80067C03	type 67C03
Y201	91-80011E04	**crystal** coupled resonator, 10.7 MHz
Y202, 203 205	91-80011E05	coupled resonator, 10.7 MHz

non-referenced items

	5-80022C01	grommet for L208
	26-80263C02	mixer shield
	26-80270A01	coil can for L102
	26-80196A01	coil can for L104
	26-80196A01	coil can for L106
	26-80121A01	shield can for L108
	26-80121A01	shield can for L201
	26-80121A01	shield can for L203
	26-80270A01	coil can for L204, L206
	26-80121A01	shield can for L207
	26-80203A01	coil can for L208
	75-05295B01	crystal insulator, 2 used
	14-84602K01	crystal insulator, 2 used
	26-80210A01	IF shield
	26-80168C01	detector shield

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number

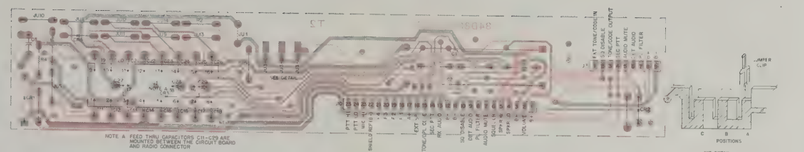
PL-6035-F (4)

HLN4192B Interconnect Board — MXW-0890-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1, 2	23-80157C02	**capacitor, fixed** 1000 µF, 25 V
C3	23-82783B25	4.7 µF ± 10%, 25 V
C11 – 29	21-84674K01	470 pF ± 20%, 25 V (feedthru)
CR1	48-8525G19	**diode (see note)** silicon
CR2	48-8304H01	silicon
CR3	48-80153A01	silicon
CR4	48-8248H18	silicon rectifier
J1	1-80701T74	**connector, receptacle** CONNECTOR, assembly, includes C11 – 29
J3	9-80156F02	female, 9-contact
J10	9-80158F03	female, 25-contact
R2	6-11009C55	**resistor, fixed ±5%, ¼ W** unless otherwise stated 1.8k
R4	6-11009C33	220
	42-80088A01	**mechanical parts** clip, option

HLN4119A Busy Light Adapter Board — PL-6323-O

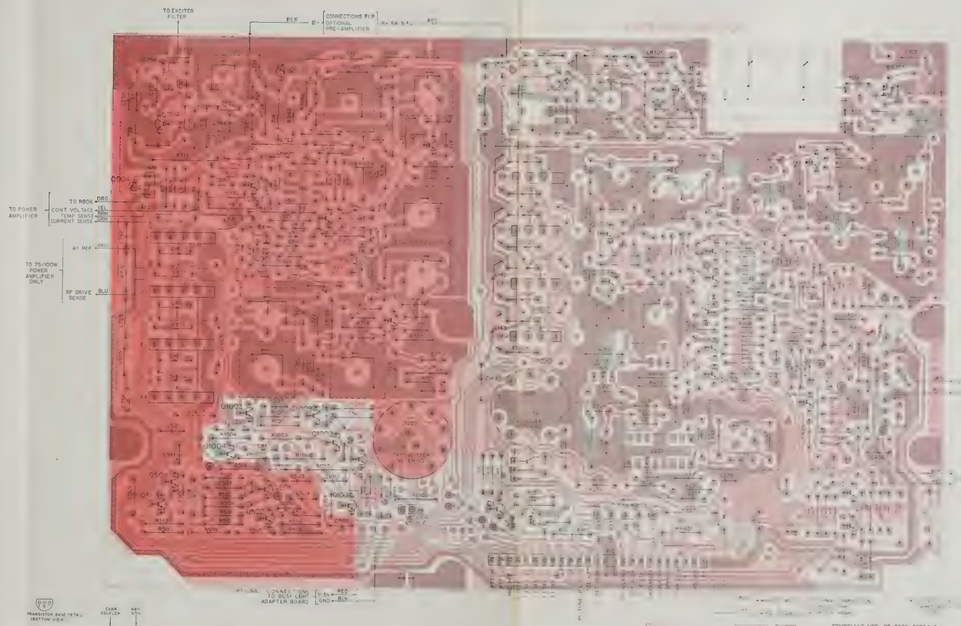
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C460	23-84665F01	**capacitor, fixed** 10 µF
L460	24-82723H05	**choke** 0.41 µF
R460	6-11009C78	**resistor, fixed, ±5%, ¼ W** unless otherwise stated 16k
R461	6-11009C69	6.8k
R462	6-11009C49	1k
R463	6-11009C61	3.3k
R464	6-11009C65	4.7k
R465	6-11009C49	1k
R466	6-11009C71	15k
R467	6-11009C66	5.1k
R468	6-11009C49	1k
R469	6-11009C63	4.7k
R470	6-11009C66	5.1k
R471	6-11009C25	100
CR460 – 462	48-8365H02	**diode (see note)** silicon
Q460	48-869642	**transistor (see note)** NPN, type M9642
Q461	48-869643	PNP, type M9643
Q467	48-869642	NPN, type M9642
Q463	48-869643	PNP, type M9643



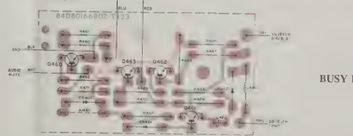
INTERCONNECT BOARD

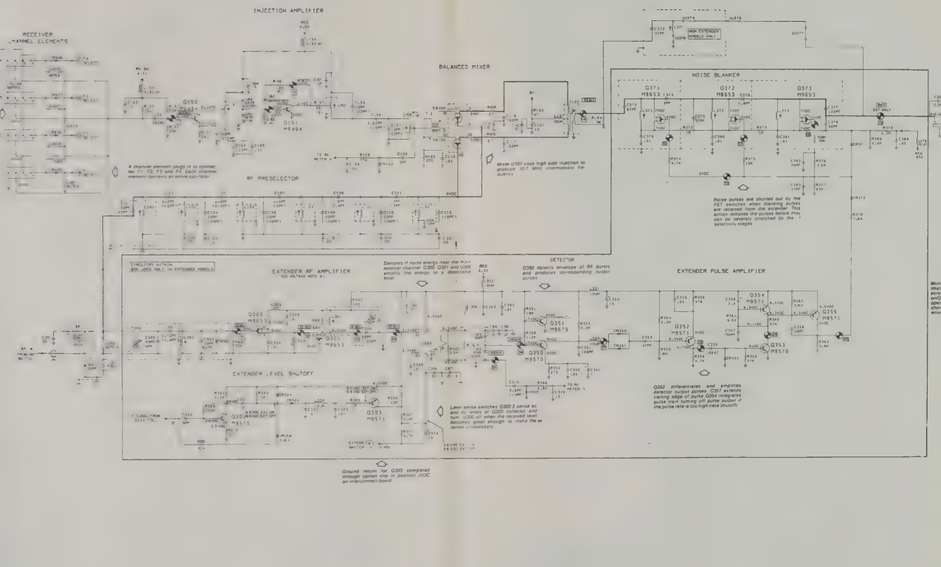
SHOWN FROM SOLDER SIDE

COMPONENT SIDE - 90-EEPS-24603-0
SOLDER SIDE - 90-EEPS-24604-0
GL-EEPS-26101-C



BUSY LIGHT ADAPTER





parts list

HLE1065A RF Preamplifier (400 – 512 MHz) PL-6689-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor: fixed, ± 10%, 500 V (unless otherwise stated)
C1	21-828778B	30 pF ± 5%
C2	21-828779J17	5 pF ± 5%
C4	21-830668E01	.01 µF, 12 V
C5	21-828778B	30 pF ± 5%
C6	21-830668E01	.02 µF, 12 V
C7	21-861608	3.3 pF, ±0.25 pF
C8, 9	21-861219	1000 pF
CR1	48-848516A01	diode (see note) not used
L1	24-827729H25	choke 33 nH
L2 – 4	24-827729H34	0.29 µH
Q1	48-869670	transistor (see note): NPN, type MRF570
R1	6-185A53	resistor fixed ± 10%, ¼ W (unless otherwise stated) 1.5k ± 5%
R2	6-185B76	56C
R3	6-185A21	68 ± 5%
R4	6-185B07	100
R5	6-185A21	68 ± 5%
J1	9-830663C01	connector, receptacle female phono receptacle
P1	28-823310G01	connector, plug male phono plug
		mechanical parts
	3-802256F02	metric tapping screw (Ø3.5 x 1.27 x 13) 2 used
	3-1036361S	metric tapping screw (TT2.5 x 40 x 6) 2 used
	4-827561H01	solder washer, 2 used
	15-802738N01	preamplifier housing
	64-802710B01	housing plate
	29-841768Z02	crimp lug, 2 used
	9-840410D01	banana plug
	20-850340D01	shield
	43-828425J01	phono plug receptacle sleeve

note: For best performance, order diodes, transistors, and integrated circuits by Motorola part number

RF PREAMPLIFIER

COMPONENT SIDE
SOLDER SIDE

MOTOROLA INC.
Communications Group

"MITREK" TWO-WAY FM RADIO

406-410 MHz
450-512 MHz
30/50/75/100 Watts

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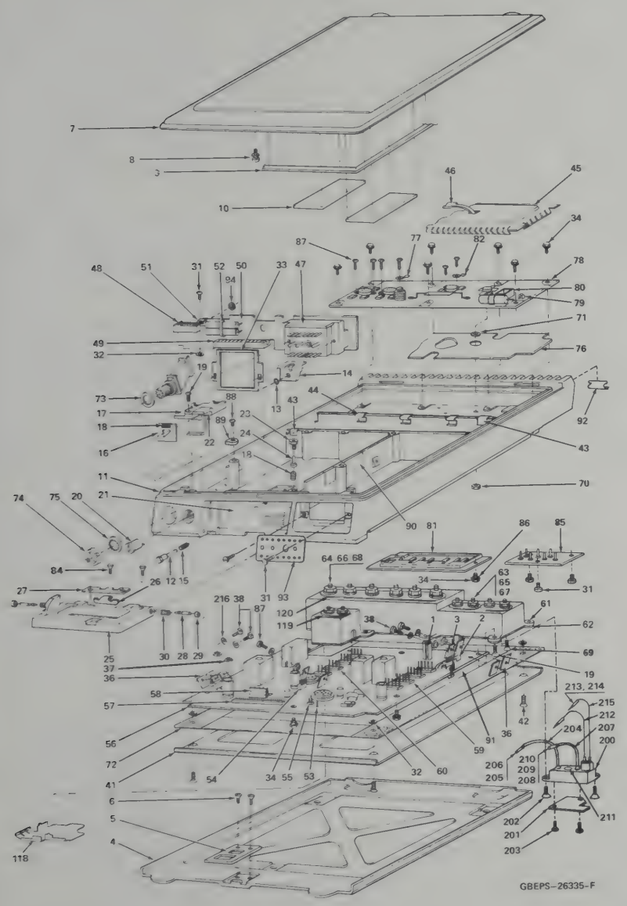
68P81045E75-A
5-9-82 GGI

UHF *Mitrek* Radio
MECHANICAL PARTS

30 AND 50 WATT RADIOS



parts list

Mechanical Parts List for UHF Radio — PL-6052-F

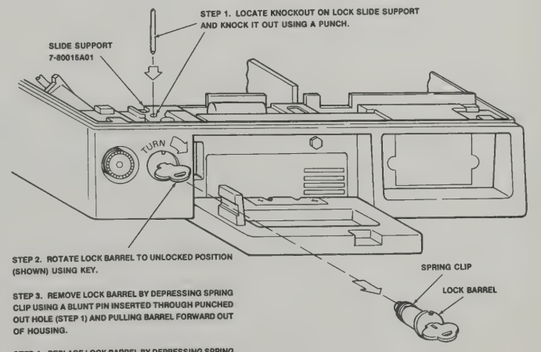
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	26-80150B01	heatsink
2	26-80093A01	transistor heatsink
3	—	Q904, Q1006, SEE ELECTRICAL PARTS LIST
4	15-84677L01	bottom cover
5	64-80017A01	latch plate
6	3-10906A05	machine screw (M3.5 x 0.6 x 6), 2 used
7	15-84678L01	top cover
8	46-80026A01	latch stud
9	32-80075A02	top cover gasket
10	75-80178A01	compression pad, 2 used
11	15-84676L01	housing
12	47-80027A01	pushbutton
13	32-80082A01	pushbutton gasket
14	7-80030A01	latch bracket
15	41-80029A01	latch spring
16	7-80016A01	lock slide bracket
17	7-80015A01	lock slide bracket
18	41-80022A01	lock spring, 2 used
19	3-80255F02	tapping screw (B3.5 x 1.27 x 13), 8 used
20	55-80370A01	lock
21	13-80063A01	escutcheon
22	32-80081A02	lock support gasket
23	43-80150A01	cover release sleeve
24	46-80151A01	cover release stud
25	55-80002A01	handle
26	7-80113B01	latch bracket
27	64-80019A01	backup plate
28	47-80021A01	pivot pin, 2 used
29	4-80017F01	pivot washer, 2 used
30	41-80175A01	spring (3.05 mm od), 2 used
31	3-10904A02	machine screw (M3.5 x 0.6 x 6), 6 used
32	4-80149A01	captivative washer, 5 used
33	32-80074A01	cable plug gasket
34	3-80254F01	tapping screw (B3.5 x 1.27 x 8), 14 used
35	14-80090A01	insulator
36	14-84391F01	mica insulator, 3 used
37	4-84180C01	shoulder washer, 5 used
38	3-10905A01	machine screw (M3 x 0.5 x 6), 3 used)
39	7-80360A01	preselector bracket
40	3-80257F01	tapping screw (M3.5 x 1.27 x 8), 2 used
41	15-80041A01	bottom inner cover
42	3-10906A19	machine screw (M3.5 x 0.6 x 13), 4 used
43	42-80013A01	coaxial clip (dress), 2 used
44	42-80292E01	coaxial clip, 3 used
45	26-80211A01	PA shield
46	55-84300B04	nylon handle
47	—	J1, SEE ELECTRICAL PARTS LIST
48	—	J3, SEE ELECTRICAL PARTS LIST
49	—	J2, SEE ELECTRICAL PARTS LIST
50	84-80056A01	interconnect circuit board
51	7-80079A01	IC board support bracket
52	42-10217A26	cable harness strap, 3 used
53	29-10271A15	terminal pin, 8 used
54	—	J901, J1003, SEE ELECTRICAL PARTS LIST
55	—	P1004, SEE ELECTRICAL PARTS LIST
56	—	UHF circuit board
57	—	P10, SEE ELECTRICAL PARTS LIST
58	—	P11, SEE ELECTRICAL PARTS LIST
59	—	P601 – P604, SEE ELECTRICAL PARTS LIST
60	—	P605 – P608, SEE ELECTRICAL PARTS LIST
61	15-8007A01	filter housing
62	64-80024A01	filter housing
63	46-80231B01	coil stud (M6.0 x 1.0P), 6 used
64	46-80232B01	coil stud (M8.0 x 1.25P), 6 used
65	3-80012A03	set screw (M6 x 1), 6 used
66	3-80256A01	set screw (M8 x 1.25), 6 used
67	2-80045A03	retainer nut (M6 x 1.0), 6 used
68	2-80045A02	retainer nut (M8 x 1.25), 6 used
69	3-80255F01	tapping screw (M3.5 x 1.27 x 8), 19 used
70	2-7003	nut (8-32 x 5/16 x 1/4")
71	4-80083A01	stud device washer
72	32-80129F01	bottom inner cover gasket
73	32-80080A01	antenna connector gasket
74	2-80006A01	spanner nut
75	4-114522	lockwasher
76	14-80077A01	PA compartment insulator
77	7-80078A01	thermistor mounting bracket, 2 used
78	—	50-W PA circuit board
79	29-80014A01	coaxial clip terminal
80	7-80157A01	transistor PA support
81	15-80003A01	filter housing
82	29-5369	lug solder
84	3-10906A10	taptite screw (M3.5 x 0.6 x 8), 2 used
85	64-80005A01	feedthru plate
86	4-7666	lockwasher (#6), 14 used
87	3-10905A05	machine screw (M3.0 x 0.5 x 8), 8 used
88	3-10904A45	machine screw (M3.5 x 0.6 x 13))
89	42-80366A01	cable clamp
90	14-80061B01	housing insulator
91	15-80133B01	preselector coaxial cable
92	14-80133F01	bottom inner cover insulator

PL-6052-F (2)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
93	32-80020C01	cable connector gasket
94	4-7607	flat washer (1.25 x 281 x .027)
100	26-80079B01	harmonic filter shield (75/100-W models)
101	—	low-level amplifier substrate (75/100-W models)
102	—	predriver in substrate (75/100-W models)
103	—	dryer in substrate (75/100-W models)
104	—	PA module board (75/100-W models), 5 used
105	26-80254A01	low-level amplifier heatsink (75/100-W models)
106	42-80137A02	substrate holder (75/100-W models)
108	32-80084A01	gasket stud plug (75/100-W models), 2 used (30/50-W models), 1 used
109	—	combiner substrate
110	—	splitter substrate
111	—	harmonic filter substrate
112	64-80067B01	harmonic filter plate
113	64-80074B01	harmonic filter gasket
114	9-80155A01	flat wafer connector, 7 used
115	14-80133F01	bottom inner cover insulator
116	75-80142B01	fracture pad
117	3-10936A10	tapping screw (M3.5 x 1.27 x 10), 5 used
118	26-80263C02	RF shield
119	42-80010D01	retaining strap, M6
120	42-80011D01	retaining strap, M8
200	15-80273B03	preamp housing
201	1-80709T12	cover and shield
202	3-10936B15	tapping screw (B3.5 x 1.26 x 13)
203	3-10943D11	screw (TT2.5 x 0.45 x 6)
204	30-83794C01	coaxial cable
208	9-84041D01	banana plug receptacle
209	43-82942L01	sleeve
210	9-83663C01	connector receptacle
211	26-80034D01	tape dot
212	30-10286B04	24-strand wire, red
213	37-82603D60	wire sleeve, 2 used
214	29-84706E02	terminal crimp socket, 2 used
215	30-10286B02	24-strand wire, black
216	4-80217D01	compression washer, 5 used

note: The *Mitrek* radio uses metric hardware and a hardware kit is available from Motorola National Parts. Order the RFX4062A *Mitrek* Metric Hardware Kit.

LOCK REMOVAL PROCEDURE



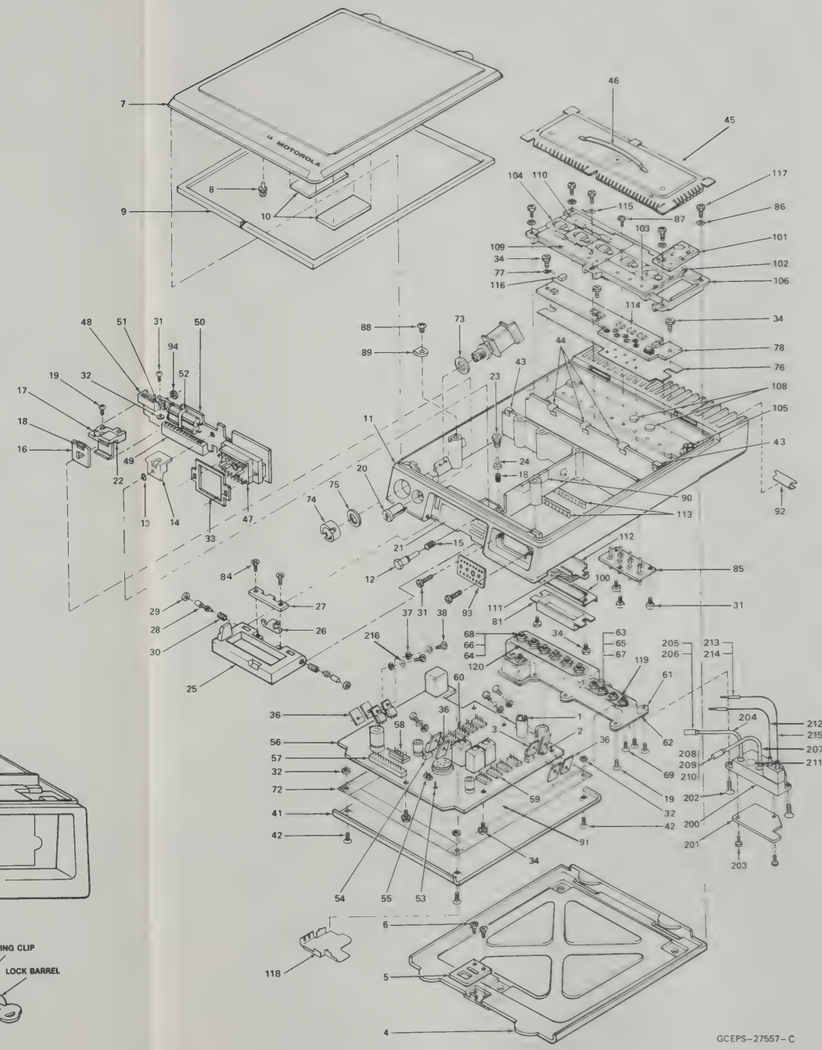
STEP 3. REMOVE LOCK BARREL BY DEPRESSING SPRING CLIP USING A BLUNT PIN INSERTED THROUGH PUNCHED OUT HOLE (STEP 1) AND PULLING BARREL FORWARD OUT OF HOUSING.

STEP 4. REPLACE LOCK BARREL BY DEPRESSING SPRING CLIP AND SLIDING BARREL BACK INTO HOUSING UNTIL SPRING CLIP SNAPS BACK INTO POSITION.

STEP 5. PLUG HOLE IN LOCK SLIDE SUPPORT (STEP 1) WITH RTV TO RESTORE WEATHER RESISTANT FEATURE OF RADIO.

GBEPS-27687-A

75 AND 100 WATT RADIOS



MOTOROLA INC.
Communications Group

"MITREK" TWO-WAY FM RADIO

406-410 MHz
450-512 MHz
30/50/75/100 Watts

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68P81045E75-A
5-9-82 GGI

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UHF 30-Watt Power Amplifier, Instruction Section 68P81039E28

ALIGNMENT

Test Equipment List and Receiver Alignment PEPS-26612
Transmitter Alignment PEPS-26613
Functional Block Diagram . . . . . Page 9
UHF 75/100-Watt Power Amplifier, Instruction Section 68P81041E33
HLN4020A Tone "Private Line" Encoder-Decoder, Instruction Section 68P81039E22
HLN4011A "Digital Private-Line" Encoder-Decoder, Instruction Section 68P81039E23
TLN5730A "Digital Private-Line" Two-Code Adapter, Instruction Section 68P81106E97
MITREK Accessories, Instruction Section 68P81039E26
MITREK Control Head and Cables, Instruction Section 68P81039E24
Commercial Warranty, Standard EPS-27734

MODEL CHART FOR UHF "MITREK" MOBILE RADIO (406-420 MHz) 30/50/100 W (450-470 MHz) 30/50/75/100 W (470-512 MHz) 19/39/59/75 W (50/100/150/200 W ERP)

CODE:

- ● = ONE ITEM SUPPLIED
- ⁄ = ONE ITEM SUPPLIED DEPENDENT UPON FREQUENCY RANGE
- 2 = QUANTITY SUPPLIED
- ■ = BREAKDOWN ON SEPARATE CHART

MODEL NUMBER	DESCRIPTION
30-WATT MODELS	
T34JJA1000BK	1-FREQUENCY CARRIER SQUELCH
T34JJA1900BK	4-FREQUENCY CARRIER SQUELCH
T34JJA3000BK	1-FREQUENCY "PRIVATE-LINE"
T34JJA3900BK	4-FREQUENCY "PRIVATE-LINE"
T34JJA6000BK	1-FREQUENCY DIGITAL "PRIVATE-LINE"
T34JJA6900BK	4-FREQUENCY DIGITAL "PRIVATE-LINE"
50-WATT MODELS	
T44JJA1000BK	1-FREQUENCY CARRIER SQUELCH
T44JJA1900BK	4-FREQUENCY CARRIER SQUELCH
T44JJA3000BK	1-FREQUENCY "PRIVATE-LINE"
T44JJA3900BK	4-FREQUENCY "PRIVATE-LINE"
T44JJA6000BK	1-FREQUENCY DIGITAL "PRIVATE-LINE"
T44JJA6900BK	4-FREQUENCY DIGITAL "PRIVATE-LINE"
75-WATT MODELS	
T64JJA1000BK	1-FREQUENCY CARRIER SQUELCH
T64JJA1900BK	4-FREQUENCY CARRIER SQUELCH
T64JJA3000BK	1-FREQUENCY "PRIVATE-LINE"
T64JJA3900BK	4-FREQUENCY "PRIVATE-LINE"
T64JJA6000BK	1-FREQUENCY DIGITAL "PRIVATE-LINE"
T64JJA6900BK	4-FREQUENCY DIGITAL "PRIVATE-LINE"
100-WATT MODELS	
T74JJA1000BK	1-FREQUENCY CARRIER SQUELCH
T74JJA1900BK	4-FREQUENCY CARRIER SQUELCH
T74JJA3000BK	1-FREQUENCY "PRIVATE-LINE"
T74JJA3900BK	4-FREQUENCY "PRIVATE-LINE"
T74JJA6000BK	1-FREQUENCY DIGITAL "PRIVATE-LINE"
T74JJA6900BK	4-FREQUENCY DIGITAL "PRIVATE-LINE"

ITEM	DESCRIPTION
■ HUE1001B	UNIFIED CHASSIS, 30-WATT (406-420 MHz)
■ HUE1002B	UNIFIED CHASSIS, 30-WATT (450-470 MHz)
■ HUE1147A	UNIFIED CHASSIS, 30-WATT (470-512 MHz)
■ HUE1011B	UNIFIED CHASSIS, 50-WATT (406-420 MHz)
■ HUE1012B	UNIFIED CHASSIS, 50-WATT (450-470 MHz)
■ HUE1153A	UNIFIED CHASSIS, 50-WATT (470-512 MHz)
■ HUE1031B	UNIFIED CHASSIS, 100/75-WATT (406-420 MHz)
■ HUE1032B	UNIFIED CHASSIS, 100/75-WATT (450-470 MHz)
■ HUE1033B	UNIFIED CHASSIS, 100/75-WATT (470-494 MHz)
■ HUE1152A	UNIFIED CHASSIS, 100/75-WATT (494-512 MHz)
HLN4020B	"PRIVATE-LINE" BOARD
HLN4011A	"DIGITAL PRIVATE-LINE" BOARD
KLN6209A	"VIBRASPONDER" RESONANT REED
TRN6005A	CODED PLUG
KXN1086B	CHANNEL ELEMENT RECEIVER
KXN1088A	CHANNEL ELEMENT TRANSMITTER
HHN4000A	HOUSING, TOP COVER, LOW POWER
HHN4001A	HOUSING, TOP COVER, HIGH POWER
HLN4034A	HOUSING, BOTTOM COVER
HCN4000A	CONTROL HEAD (1-FREQUENCY), CARRIER SQUELCH
HCN4001A	CONTROL HEAD (4-FREQUENCY), CARRIER SQUELCH
HCN4002A	CONTROL HEAD (1-FREQUENCY), "PRIVATE-LINE"
HCN4001A	CONTROL HEAD (4-FREQUENCY), "PRIVATE-LINE"
HMN4000B	MICROPHONE
HSN4000A	SPEAKER
HKN4000A	CONTROL CABLE (17-FT), 1-FREQUENCY
HKN4001A	CONTROL CABLE (17-FT), 4-FREQUENCY
HKN4016A	CONTROL CABLE (17-FT), 1-FREQUENCY, HIGH POWER
HKN4017A	CONTROL CABLE (17-FT), 4-FREQUENCY, HIGH POWER
HKN4041A	CABLE, FUSE AND RED LEAD, HIGH POWER
HLN4024A	MICROPHONE HANGUP BOX
TAE6061B	ANTENNA (406-430 MHz)
TAE6062B	ANTENNA (450-470 MHz)
TAE6094B	ANTENNA (470-494 MHz)
TAE6095B	ANTENNA (494-512 MHz)
HLN4022A	INSTALLATION KIT
HLN4023A	TUNING TOOL KIT

EPW-0031-O

"MITREK"
TWO-WAY FM RADIO
UNIFIED CHASSIS MODEL CHART
406-420 MHz
450-470 MHz
470-494 MHz
494-512 MHz
30/50/75/100 WATTS

CODE:

● = ONE ITEM SUPPLIED

■ = BREAKDOWN ON SEPARATE CHART

MODEL NUMBER	DESCRIPTION	1001B	1002B	1147A	1011B	1012B	1153A	1031B	1032B	1033A	1152A
HUE1001B	UNIFIED CHASSIS, 30W (406-420 MHz)	●			●			●			
HUE1002B	UNIFIED CHASSIS, 30W (450-470 MHz)		●			●			●		
HUE1147A	UNIFIED CHASSIS, 30W (470-512 MHz)			●			●				●
HUE1011B	UNIFIED CHASSIS, 50W (406-420 MHz)	●			●			●			
HUE1012B	UNIFIED CHASSIS, 50W (450-470 MHz)		●			●			●		
HUE1153A	UNIFIED CHASSIS, 50W (470-512 MHz)			●			●				●
HUE1031B	UNIFIED CHASSIS, 100/75W (406-420 MHz)	●			●			●			
HUE1032B	UNIFIED CHASSIS, 100/75W (450-470 MHz)		●			●			●		
HUE1033A	UNIFIED CHASSIS, 100/75W (470-494 MHz)			●			●			●	●
HUE1152A	UNIFIED CHASSIS, 100/75W (494-512 MHz)			●			●			●	●

MODEL	DESCRIPTION
■ HLE1001C	POWER AMPLIFIER, 30-WATT (406-420 MHz)
■ HLE1002C	POWER AMPLIFIER, 30-WATT (450-512 MHz)
■ HLE1011C	POWER AMPLIFIER, 50-WATT (406-420 MHz)
■ HLE1012C	POWER AMPLIFIER, 50-WATT (450-512 MHz)
■ HLE1031B	POWER AMPLIFIER, 100/75-WATT (406-420 MHz)
■ HLE1032B	POWER AMPLIFIER, 100/75-WATT (450-494 MHz)
■ HLE1033B	POWER AMPLIFIER, 100/75-WATT, (494-512 MHz)
HLE4001C	MAIN BOARD, UHF (406-420 MHz)
HLE4002C	MAIN BOARD, UHF (450-470 MHz)
HLE4158A	MAIN BOARD, UHF (470-512 MHz)
HLE4105A	RF DECK, UHF (406-420 MHz)
HLE4106A	RF DECK, UHF (450-470 MHz)
HLE4107A	RF DECK, UHF (470-512 MHz)
HLN4015B	HARDWARE KIT
HLN4019A	HARDWARE WIRING KIT
HLN4033A	BOTTOM COVER, INNER, AND GASKET
HLN4044A	INTERCONNECT BOARD
HLN4036B	HARDWARE KIT, HI-POWER, 100/75 W
HLN4047A	HARDWARE WIRING KIT, HI-POWER
HLN4189A	HARDWARE

EPW-0032-O

"MITREK" MODEL CHART
TWO-WAY FM RADIO
POWER AMPLIFIER
BREAKDOWN:
406-420 MHz
450-494 MHz
494-512 MHz
30/50/75/100 WATTS

CODE:

● = ONE ITEM SUPPLIED

ITEM	DESCRIPTION	HLE1001C POWER AMPLIFIER, 30W (406-420 MHz)	HLE1002C POWER AMPLIFIER, 30W (450-512 MHz)	HLE1011C POWER AMPLIFIER, 50W (406-420 MHz)	HLE1012C POWER AMPLIFIER, 50W (450-512 MHz)	HLE1031B POWER AMPLIFIER, 100/75W (406-420 MHz)	HLE1032B POWER AMPLIFIER, 100/75W (450-494 MHz)	HLE1033B POWER AMPLIFIER, 100/75W (494-512 MHz)
HLE4011C	PA BOARD, 30W (406-420 MHz)	●						
HLE4012C	PA BOARD, 30W (450-512 MHz)		●					
HLE4021C	PA BOARD, 50W (406-420 MHz)			●				
HLE4022C	PA BOARD, 50W (450-512 MHz)				●			
HLE4151A	POWER DISTRIBUTION BOARD					●	●	●
HFE4000A	HARMONIC FILTER, LO-POWER (406-420 MHz)	●		●				
HFE4001A	HARMONIC FILTER, LO-POWER (450-512 MHz)		●		●			
HFE4002A	HARMONIC FILTER, HI-POWER (406-420 MHz)					●		
HFE4003A	HARMONIC FILTER, HI-POWER (450-512 MHz)						●	●
HLE4041A	TRANSISTOR KIT, 30W, UHF	●	●					
HLE4042A	TRANSISTOR KIT, 50W, UHF (406-420 MHz)			●				
HLE4043A	TRANSISTOR KIT, 50W, UHF (450-512 MHz)				●			
HLE4060A	LOW-LEVEL AMPLIFIER				●	●	●	●
HLE4064A	COMBINER SUBSTRATE, 75/100W (406-420 MHz)				●			
HLE4065A	COMBINER SUBSTRATE, 75/100W (450-494 MHz)					●		
HLE4066A	COMBINER SUBSTRATE, 75/100W (494-512 MHz)						●	
HLE4069A	SPLITTER SUBSTRATE, 75/100W (406-420 MHz)				●			
HLE4070A	SPLITTER SUBSTRATE, 75/100W (450-512 MHz)					●	●	
HLE4074A	DRIVER INPUT SUBSTRATE, 75/100W				●	●	●	
HLE4078A	PREDRIVER SUBSTRATE, 75/100W (406-420 MHz)				●			
HLE4079A	PREDRIVER SUBSTRATE, 75/100W (450-512 MHz)					●	●	
HLE4082A	TRANSISTOR KIT, 75/100W (406-420 MHz)				●			
HLE4083A	TRANSISTOR KIT, 75/100W (450-494 MHz)					●		
HLE4084A	TRANSISTOR KIT, 75/100W (494-512 MHz)						●	
HLN4006B	PA HARDWARE KIT, UHF, 30W (450-512 MHz)		●					
HLN4007B	PA HARDWARE KIT, UHF, 50W (450-512 MHz)				●			
HLN4008A	PA HARDWARE KIT, UHF, 75/100W (406-420 MHz)					●		
HLN4009B	PA HARDWARE KIT, UHF, 75/100 (450-512 MHz)						●	●
HLN4017A	FEED-THRU PLATE, LO-POWER	●	●	●	●			
HLN4229A	CAPACITOR KIT					●		
HLN4040A	CAPACITOR KIT						●	●
HLN4046A	FEED-THRU PLATE, HI-POWER					●	●	●
HLN4081B	LO-POWER HARDWARE KIT, 30W (406-420 MHz)	●						
HLN4082B	LO-POWER HARDWARE KIT, 50W (406-420 MHz)			●				
HLN4184A	ANTENNA RELAY	●	●	●	●	●	●	●

EPW-0033-O

SPECIFICATIONS

GENERAL

Dimensions (30/50W)	30/50 W; 6.35 cm x 25.4 cm x 30.48 cm (2.5" x 10" x 10" x 12") 75/100 W; 6.35 cm x 25.4 cm x 39.6 cm (2.5" x 10" x 14.5")
Frequency Range	406-420 MHz, 450-512 MHz
Weight (Less acc)	30/50 W; 4.76 kg (10.5 pounds) 75/100W; 6.24 kg (13.75 pounds)
Temperature Range	-30 to 60°C
No. of Frequencies	1 to 4
Polarity	+/− Ground

CURRENT REQUIREMENTS

Standby		0.45A@13.8V
Receiver		2.0A@13.8V
Transmitter	(30W)	12A@13.6V
	(50W)	16A@13.6V
	(75W)	23.0@13.4V
	(100W)	30.0@13.4V

TRANSMITTER

Power Out	(406-420 MHz, 450-470 MHz) 30/50/75/100W *(470-512 MHz) 19/39/59/78W; (50/100/150/200 W ERP)
Stability	5 PPM
Distortion	3%
FM Noise	70 dB
Spurs	85 dB
Freq. Separation	9 MHz

RECEIVER

Sensitivity	0.5uV(0.25 uV with optional preamp)
Intermodulation	85 dB (80 dB with optional preamp)
Selectivity	90 dB (25 kHz)
Stability	5 PPM
Modulation Acceptance	±7 kHz
Spurs	100 dB
Audio Power	8 Watts
Distortion	5%
Freq. Separation	2 MHz

"MITREK", "MOCOM"•70, "PRIVATE-LINE", "DIGITAL PRIVATE-LINE", and "SYSTEMS 90" are trademarks of Motorola, Inc.

*Power output on the 470-512 MHz models is adjusted to provide and ERP output in 50 W increments up to a maximum of 200 W ERP.

"MITREK" OPTIONS

Time-Out Timer HLN4012A
Preamplifier HLE1065A (406-512MHz)
Busy Light Adapter HLN4119A and Applicable Control Head

Handset TMN6057A and Handset Hangup Box TLN4698A
Microphone Hangup Box with Monitor Switch HLN4025A
Handset Hangup Box with Monitor Switch TLN4507A

Positive Ground Cable Kits
Optional 10 and 22 foot Cable Kits
Ignition Sense Lead HKN4007A

Non Weather-Resistant Control Head HCN4004/5/8-11A
Non Weather-Resistant Microphone HMN4001B

Full Line of **SYSTEMS 90** Control Group Options
SYSTEMS 90 Control Cables

FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by Instruction Manual Revisions (WMR). These WMR's are added to the manuals as the engineering changes are incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

3. SERVICE

Motorola's National Service Organization offers one of the finest nation-wide installation and maintenance programs available to communication equipment users. This organization includes approximately 900 authorized Motorola Service Stations (MSS) located throughout the United States, each manned by one or more trained, FCC-licensed technicians.

These MSS's are independently owned and operated and were selected by Motorola to service its customers. Motorola maintenance is available on either a time and material basis or on a periodic fixed-fee type arrangement.

The administrative staff of this organization consists of national, area, and district service managers and district representatives, all of whom are Motorola employees with the objective to improve the service to our customers.

Should you wish to purchase a service contract for your Motorola equipment, contact your Motorola Service Representative, or write to:

National Service Manager
Motorola Communications and Electronics, Inc.
1303 E. Algonquin Road
Schaumburg, Illinois 60196

4. REPLACEMENT PARTS ORDERING

Motorola maintains a number of parts offices strategically located throughout the United States. These facilities are staffed to process parts orders, identify part numbers, and otherwise assist in the maintenance and repair of Motorola Communications Group products.

Orders for all parts *except* crystals, active filters, code plugs, channel elements, and "Vibrasender" ® and "Vibrasponder" ® resonant reeds should be sent to the nearest area parts center. Orders for instruction manuals should also be sent to the area parts center.

When ordering replacement parts or equipment information, include the complete identification number. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Orders for crystals, channel elements, active filters, PROM's, code plugs, and reeds should be sent directly to the factory address listed on the following page. Crystal and channel element orders should specify the crystal or channel element type number, crystal and carrier frequency, and the chassis model number in which the part is used.

Orders for active filters, PROM's, code plugs, **Vibrasender** and **Vibrasponder** resonant reeds should specify type number and frequency, should identify the owner/operator of the communications system in which these items are to be used, and should include any serial numbers stamped on the components being replaced.

5. ADDRESSES

5.1 GENERAL OFFICES

MOTOROLA Communications and Electronics Inc.
Communications Group Parts Dept.
1313 E. Algonquin Rd.
Schaumburg, Illinois 60196
Phone: 312-576-3900

5.2 U.S. ORDERS

WESTERN AREA PARTS
1170 Chess Drive, Foster City
San Mateo, California 94404
Phone: 415-349-3111
TWX: 910-375-3877

MIDWEST AREA PARTS
1313 E. Algonquin Road
Schaumburg, Ill. 60196
Phone: 312-576-7322
TWX: 910-693-0869

MID-ATLANTIC AREA PARTS
7230 Parkway Drive
Hanover, Maryland 20176
Phone: 301-796-8600
TWX: 710-862-1941

EAST CENTRAL AREA PARTS
12995 Snow Road
Parma, Ohio 44130
Phone: 216-267-2210
TWX: 810-421-8845

EASTERN AREA PARTS
85 Harristown Road
Glen Rock, New Jersey 07452
Phone: 201-447-4000
TWX: 710-988-5602

PACIFIC SOUTHWESTERN AREA PARTS
P.O. Box 85036
San Diego, California 92138
Phone: 714-578-2222
TWX: 910-335-1634

GULF STATES AREA PARTS
8550 Katy Freeway
Suite 128
Houston, Texas 77024
Phone: 713-932-8955

SOUTHWESTERN AREA PARTS
P.O. Box 34290
3320 Belt Line Road
Dallas, Texas 75234
Phone: 214-241-2151
TWX: 910-860-5505

SOUTHEASTERN AREA PARTS
P.O. Box 368
Decatur, Georgia 30031
Phone: 504-981-9800
TWX: 810-766-0876

5.3 CANADIAN ORDERS

MOTOROLA LTD.
National Parts Department
3125 Steeles Avenue
Willowdale, Ontario M2H 2H6
Phone: 416-499-1441
TWX: 610-492-2713
Telex: 065-25191

5.4 ALL COUNTRIES EXCEPT U.S. AND CANADA

MOTOROLA, INC. OR MOTOROLA AMERICAS, INC.
International Parts Dept.
1313 E. Algonquin Road
Schaumburg, Illinois 60196 U.S.A.
Phone: 312-576-6492
TWX: 910-693-0869
Telex: 722443 or 722424
Cable: MOTOL PARTS

5.5 FACTORY ADDRESS FOR CRYSTAL, CHANNEL ELEMENT, ACTIVE FILTER, CODE PLUG, PROM, AND RESONANT REED ORDERS

ALL MAIL ORDERS
Motorola, Inc.
Component Products Sales & Service
P.O. Box 66191
O'Hare International Airport
Chicago, Ill. 60666

CORRESPONDENCE
Motorola, Inc.
Component Products Sales & Service
2553 N. Edgington Street
Franklin Park, Illinois 60131

MOTOROLA INC.
Communications Group

GENERAL SAFETY INFORMATION

The United States Department of Labor, through the provisions of the Occupational Safety and Health Act of 1970 (OSHA), has established an electromagnetic energy safety standard which applies to the use of this equipment. Proper use of this radio will result in exposure below the OSHA limit. The following precautions are recommended:

DO NOT operate the transmitter of a mobile radio when someone outside the vehicle is within two feet (0.6 meter) of the antenna.

DO NOT operate the transmitter of a fixed radio (base station, microwave, and rural telephone rf equipment) or marine radio when someone is within two feet (0.6 meter) of the antenna.

DO NOT operate the transmitter of any radio unless all RF connectors are secure and any open connectors are properly terminated.

In addition,

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere.

All equipment must be properly grounded according to Motorola installation instructions for safe operation.

All equipment should be serviced only by a qualified technician.

Refer to the appropriate section of the product service manual for additional pertinent safety information.

WARNING

For vehicles equipped with electronic anti-skid braking systems, see "ANTI-SKID BRAKING PRECAUTIONS," Motorola Publication 68P81109E34.

NOTE

See page 2 for another important warning.

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technical publication services
5555 North Beach Street, Fort Worth, Texas 76137

WARNING

It is mandatory that radio installations in vehicles fueled by liquefied petroleum gas conform to the following standard.

National Fire Protection Association standard NFPA 58 applies to radio installations in vehicles fueled by liquefied petroleum (LP) gas with the LP-gas container in the trunk or other sealed-off space within the interior of the vehicles. This standard requires that:

1. Any space containing radio equipment shall be isolated by a seal from the space in which the LP-gas container and its fittings are located.

2. Remote (outside) filling connections shall be used.

3. The container space shall be vented to the outside.

MITREK

RADIO AND CONTROL HEAD
PREINSTALLATION CONSIDERATIONS

POWER LEAD COLORS

vention for power leads used in MITREK represents a departure
ention used in MOCOM•70 and earlier radios. In the MITREK
lead is always positive and the black lead is always negative. The
ements summarize the use in MITREK installations:

hassis ground. It is:
n negative ground systems
n positive ground systems

attery hot. It is:
n negative ground systems
n positive ground systems

PRE-INSTALLATION BENCH TESTS

SET
ncy, power output, modulation, and receiver sensitivity before
radio.

OL HEAD
ion of all controls and indicators on the control head before and
ion.

INSTALLATION

WARNING

It is mandatory that radio installations in vehicles fueled by liquefied petroleum gas conform to the following standard.

National Fire Protection Association standard NFPA 58 applies to radio installations in vehicles fueled by liquefied petroleum (LP) gas with the LP-gas container in the trunk or other sealed-off space within the interior of the vehicles. This standard requires that:

1. Any space containing radio equipment shall be isolated by a seal from the space in which the LP-gas container and its fittings are located.

2. Remote (outside) filling connections shall be used.

3. The container space shall be vented to the outside.

INSTALLATION PLANNING

CONTROL HEAD LOCATION

Recommended mounting surfaces include under the dashboard, transmission hump, and center console. The installation must not interfere with operation of the vehicle and its accessories, nor distrub passenger seating or leg space. In addition, the unit must be within convenient reach of the user(s).

ANTENNA LOCATION

The best location for the antenna is the center of the vehicle roof. A good alternate location is the center of the trunk lid. If the trunk lid is used on low band radio installation ONLY, straps must connect the trunk lid to ground points on the vehicle body. Be sure you know that the antenna cable can be acceptably routed to the radio set location *before* you mount the antenna. Refer to the antenna instruction manual for details.

IGNITION SENSE LEAD (OPTIONAL)

The optional fused (1.5 A) orange ignition sense lead should be connected to the ignition switch terminal which is hot in both the "Accessory" and "On" position. Use of this option will allow the radio to be used in the standby (receive only) mode when the ignition key is removed from the vehicle.

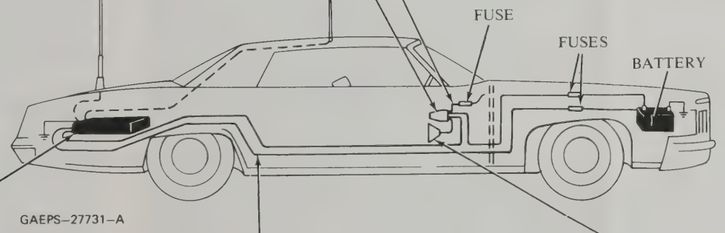
PRIMARY POWER CONNECTIONS

The best power connection point for the hot primary power lead and the green lead is at the hot battery terminal. Be sure that the point chosen is always close to 13.6 volts. Some vehicles switch to a higher-than-normal voltage during starting.

The radio set negative primary power lead should be connected to a good ground point on the vehicle chassis.

GENERAL SAFETY INFORMATION

Antennas must be installed at least two feet (0.6 meter) from vehicle operators and passengers unless shielded by a metallic surface.



RADIO SET LOCATION

In most vehicles the best location for the radio unit is the floor of the trunk compartment. Regardless of the location choice, be sure the radio set is protected from dirt and moisture and that there is sufficient space around the radio unit to allow adequate cooling and removal.

SPEAKER

The included trunnion bracket provides a large variety of permanent mountings (dashboard and accessible firewall areas).

CONTROL AND POWER CABLE ROUTING

Many vehicles are equipped with wire troughs in the door sills. If the vehicle has this feature, use it to provide maximum protection for the cable and to simplify the cable installation. In vehicles without wiring troughs the control and power cables must be routed where they are protected from pinching, sharp edges, and crushing. One suggested route is along one side of the drive shaft hump under the carpet. Be sure grommets are used whenever the cable must pass through a hole in a metal panel.

IMPORTANT

MEASURING AND SETTING POWER OUTPUT

The Motorola **MITREK** fm two-way radio you are installing has been tested for proper transmitter power output before leaving the factory. Each radio is set to the proper output power level while connected to an accurate 50 ohm load impedance. Once the power level has been set, the internal power control/protection circuitry will adjust the power output to a maximum safe level whenever it senses a load impedance different from 50 ohms. The operation of this circuitry may be different from that of other Motorola products you have installed.

When setting and measuring transmitter output power, follow these guidelines:

1. Be sure to use a good 50-ohm load and a test cable that is as short as possible. We recommend one of the arrangements shown in Figure 1.

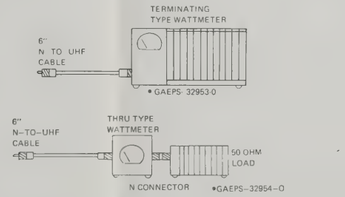


Figure 1. Test Setups for 800 MHz Alignment

In general, connector pairs of the "UHF" type do not make acceptable 50- ohm connections above high-band frequencies. However, the UHF female connector at the front of the radio is specially designed and constructed for the *Mitrek* radio to make a good 50-ohm connection with a mating UHF male connector. Any other UHF-type connections added between the radio and the load will cause the load to vary from 50 ohms and will result in an apparent reduction in output power due to the normal operation of the control/protection circuit. This variation is power with degraded load impedance will be much more noticeable in the UHF and 800-MHz bands than in the VHF bands. If power seems to be unusually low (lower than can be explained by the normal calibration differences you experience), *check your test setup.*

2. A thruline-type wattmeter will not measure radio output power into an antenna accurately. This is due to the addition of extra UHF connector pins and cable between the radio and the antenna. The technique is adequate for measuring antenna VSWR, however, Motorola antennas should reflect less than 1 watt of power for every 20 watts forward (less than 1.5:1 VSWR).

CAUTION

Do not retune the radio into the antenna; *doing so may cause improper operation of the unit and may be a violation of FCC regulations. If the radio and antenna are each properly tuned, the power control/protection circuitry will allow the radio to deliver maximum safe power to the antenna.*

POWER LEAD COLORS

The color convention for power leads used in MITREK represents a departure from the convention used in MOCOM•70 and earlier radios. In the MITREK system the red lead is always positive and the black lead is always negative. The following statements summarize the use in MITREK installations:

Short lead is chassis ground. It is:
- Black (-) in negative ground systems
- Red (+) in positive ground systems

Fused lead is battery hot. It is:
- Red (+) in negative ground systems
- Black (-) in positive ground systems

PRE-INSTALLATION BENCH TESTS

A. RADIO SET
Check frequency, power output, modulation, and receiver sensitivity before installing the radio.

B. CONTROL HEAD
Verify operation of all controls and indicators on the control head before and after installation.

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(Sheet 1 of 4)
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:ONSIDERATIONS

INSTALLATION		
_	MOCOM•70	
)	—GND	+ GND
3)	•(Note 1)	X
	•(Notes 1, 4)	X
	•	•(Note 2)
	•(Note 2)	•

2. Clip off the terminals from these two leads and both back 13mm (1/2 inch).

3. Twist the two leads together and crimp on the d end splice connector (part number 2980) supplied with the installation kit. See Figure.

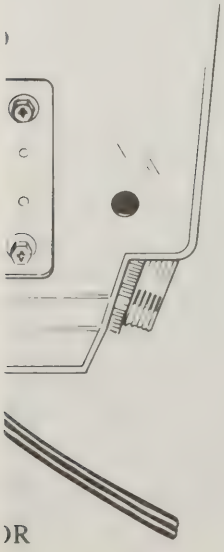
NOTE

If a MITREK control head is used with a MOCOM•70 cable kit in a PL system, then the MOCOM•70 hangup box must also be replaced with a MITREK unit (HLN4024A). Also jumper JU101 must be omitted from the MITREK control head circuit board when the orange ignition switch lead is used.

RADIO INSTALLATION

eed with radio set mounting instruction on the r side of this sheet.

)IFICATIONS



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CABLE ROUTING

WARNING

For vehicles equipped with electronic anti-skid braking systems see "ANTI-SKID BRAKING PRECAUTIONS" Publication, Motorola Number 68P81109E34.

Work from the trunk space forward. In some cars there is room above the fiberboard trunk partition to admit the cables. If this is not the case, make an opening through the partition.

Tape the pin-tip connectors into a small bundle. Pass it and the long power lead forward into the passenger compartment.

Remove the back seat. Pull the cables into the back seat area, under the seats and floor mats out the top of the floor mat under the dash. Where no specific channel is provided, route the cable under the floor mat along the side of the drive-shaft hump.

Pull the control cable pin-tip connectors to the approximate location of the control head. Locate or make a hole through the firewall to route the power cable into the engine compartment. The hole must be 28.6 mm (1-1/8") in diameter to fit the supplied rubber grommet. Install the grommet. Pull the red power cable and fuse holder through the grommeted hole.

On high power models install the fuse holder clip at a convenient location near the battery.

The cable kit contains an additional separate green wire equipped with an in-line fuse. Pass the pin tip end of the green wire from the engine compartment side of the firewall, through the grommeted hole, into the passenger compartment.

An optional orange wire with fuse may be supplied. This wire will connect from the control head to the ignition switch.

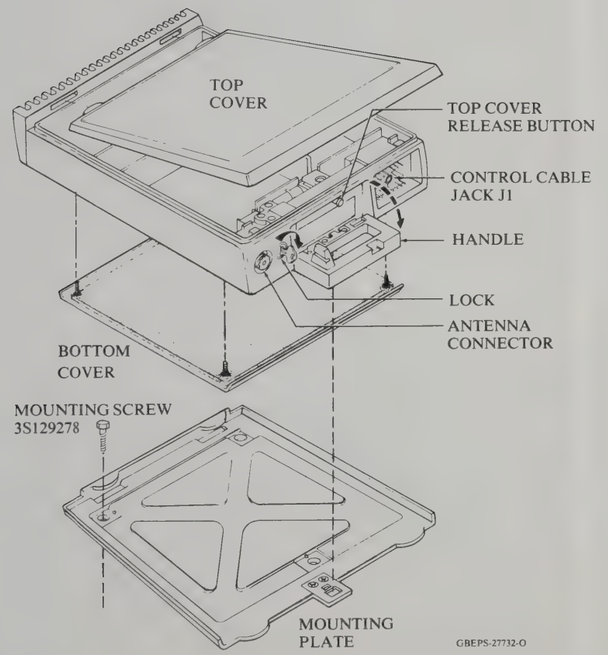
Do not dress the wires at this time but proceed with the radio set mounting procedure.

DISASSEMBLY

RADIO SET REMOVAL

Step 1. Insert the key into the lock and turn it clockwise. Pull the handle down.

Step 2. Remove the radio from the mounting plate by pulling forward with the handle.



RADIO SET REPLACEMENT

Step 1. Lower the radio set onto the mounting plate using the handle. The handle should be in the fully open position.

Step 2. Slide the radio backward until the projections at the front and rear of the mounting plate engage the slots on the front and rear of the radio.

Step 3. Swing the handle up until it locks into position. Lift on the front of the radio to make sure that the latching mechanism on the handle has engaged the latch plate on the front of the mounting plate.

TOP COVER REMOVAL

Step 1. Insert the key into the lock and turn it clockwise. Pull the handle down, exposing the release button.

Step 2. Push the release button. The top cover will pop open.

Step 3. Remove the top cover by raising the front and pulling it forward.

TOP COVER REPLACEMENT

Step 1. Slip the projections at the rear of the top cover into the slots in the radio housing holding the cover with the front tipped slightly upward.

Step 2. Lower the front of the cover in place until it snaps. The top latch will then be engaged.

BOTTOM COVER REMOVAL

Step 1. Remove the radio set from the vehicle and turn it upside down on a workbench.

Step 2. Unscrew the four Phillips head screws securing the bottom cover and lift the cover from the radio.

MOCOM•70 RETROFIT CONSIDERATIONS

A. SYSTEM COMPATIBILITY

RADIO TO BE INSTALLED	VEHICLE INSTALLATION: MITREK —GND	MITREK +GND	MOCOM•70 —GND	MOCOM•70 +GND
MITREK —GND	•	•(Note 3)	•(Note 1)	X
MITREK +GND	•	•	•(Notes 1, 4)	X
MOCOM•70 —GND	•	X	•	•(Note 2)
MOCOM•70 +GND	•(Note 2)	X	•(Note 2)	•

• = Compatible X = Not compatible

NOTES
1. Modify control head as described below.
2. Reverse MOCOM•70 positive ground adapter.
3. Remove JU1 from Interconnect Board of MITREK radio. (JU1 is only required when MITREK radios are used with negative ground MOCOM•70 accessories.)
4. Add JU1 to Interconnect Board of MITREK radio.

B. MODIFICATION TO MOCOM•70 CONTROL HEAD

When installing a MITREK radio into an existing negative ground MOCOM•70 installation, the following modification must be made to the control head:

Step 1. Remove the green lead from pin 5 of the MOCOM•70 control head connector. Remove the lead for the grounded side of the speaker from the same connector.

Step 2. Clip off the terminals from these two leads and strip both back 13mm (1/2 inch).

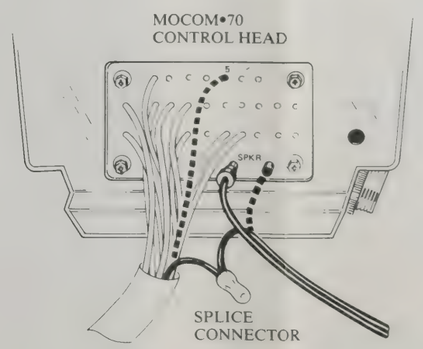
Step 3. Twist the two leads together and crimp on the closed end splice connector (part number 29-812980) supplied with the installation kit. See Figure.

NOTE
If a MITREK control head is used with a MOCOM•70 cable kit in a PL system, then the MOCOM•70 hangup box must also be replaced with a MITREK unit (HLN4024A). Also jumper JU101 must be omitted from the MITREK control head circuit board when the orange ignition switch lead is used.

C. RADIO INSTALLATION

Proceed with radio set mounting instruction on the other side of this sheet.

MOCOM•70 CONTROL HEAD MODIFICATIONS



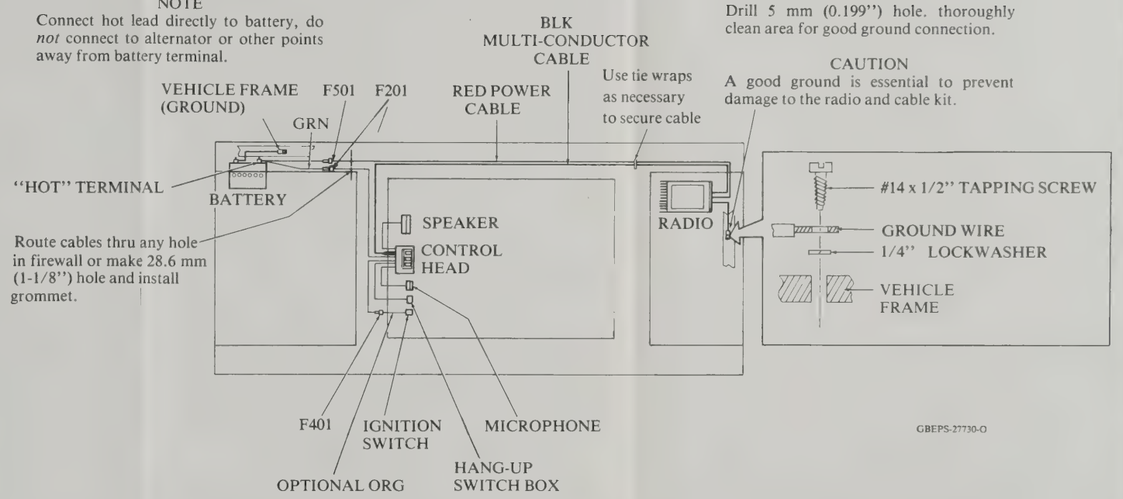
ANTENNA INSTALLATION

A diagram and complete installation instructions are supplied with each antenna ordered.

POWER CONNECTIONS

NOTE
In vehicles where battery is grounded to engine block, the frame and engine block should be connected with a heavy braided grounding strap.

NOTE
Connect hot lead directly to battery, do *not* connect to alternator or other points away from battery terminal.



Step 1. Connect the fused power cable (red for —Gnd, black for +Gnd) from the trunk to the ungrounded battery terminal. NOTE: For positive ground installations remove jumper JU1 on interconnect board in the MITREK radios.

Step 2. Connect the fused green wire from the control head also to the ungrounded battery terminal.

Step 3. If the ignition switch option is used, connect the orange fused lead from the control head to the ignition switch terminal which is hot when the switch is either in the ON or ACCESSORY position. Remove jumper JU101 in the control head.

Step 4. Locate a good site near the radio for the ground connection. This connection should be made directly to the vehicle frame. Drill a 5mm (0.199 inch) hole after checking clearance behind the hole location to make sure the drill or screw will not encounter the gas tank or other obstacles. Carefully scrape or wire brush the surface around the hole to assure a good electrical connection.

Step 5. Attach the unfused power lead from the radio (black for —Gnd, red for +Gnd) to the frame using the fourth mounting screw and the lockwasher provided. The lockwasher should be inserted between the wire lug and the grounding surface; the mounting screw does not need an additional lockwasher as it is self-locking.

Step 6. Dress all cables, securing them with tie-straps as required.

Table 1.
Contents of Installation Kit

Qty.	Part No.	Description	Qty.	Part No.	Description
4	3-139965	Screw, tapping, 1/4-14 x 1/2	1	3-140075	screw, tapping, 1/4-14 x 7/8"
1	4-7688	Washer, locking, 1/4 internal	1	3-140076	screw, tapping, 1/4-14 x 1-1/8"
1	29-812980	Terminal, crimp, closed end	1	3-140077	screw, tapping, 1/4-14 x 1-1/2"
1	37-103890	Grommet, rubber	3	43-82292M01	BUSHING, spacer
6	42-10217A14	Strap, tie, 0.140 x 5.50, nylon			

CABLE ROUTING

WARNING

For vehicles equipped with electronic anti-skid braking systems see "ANTI-SKID BRAKING PRECAUTIONS" Publication, Motorola Number 68P81109E34.

Work from the trunk space forward. In some cars there is room above the fiberboard trunk partition to admit the cables. If this is not the case, make an opening through the partition.

Tape the pin-tip connectors into a small bundle. Pass it and the long power lead forward into the passenger compartment.

Remove the back seat. Pull the cables into the back seat area, under the seats and floor mats out the top of the floor mat under the dash. Where no specific channel is provided, route the cable under the floor mat along the side of the drive-shaft hump.

Pull the control cable pin-tip connectors to the approximate location of the control head. Locate or make a hole through the firewall to route the power cable into the engine compartment. The hole must be 28.6 mm (1-1/8") in diameter to fit the supplied rubber grommet. Install the grommet. Pull the red power cable and fuse holder through the grommeted hole.

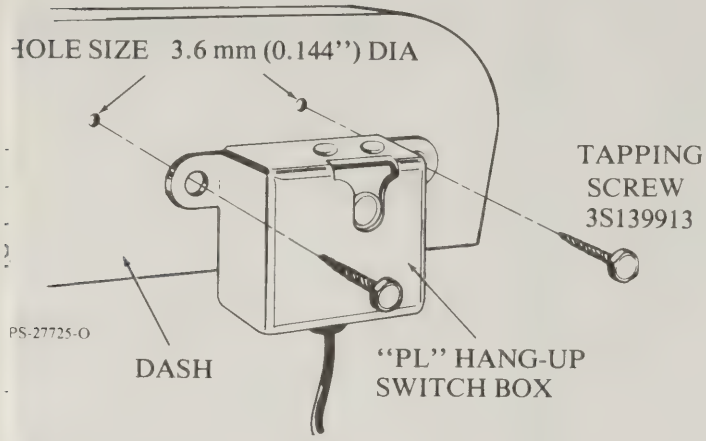
On high power models install the fuse holder clip at a convenient location near the battery.

The cable kit contains an additional separate green wire equipped with an in-line fuse. Pass the pin tip end of the green wire from the engine compartment side of the firewall, through the grommeted hole, into the passenger compartment.

An optional orange wire with fuse may be supplied. This wire will connect from the control head to the ignition switch.

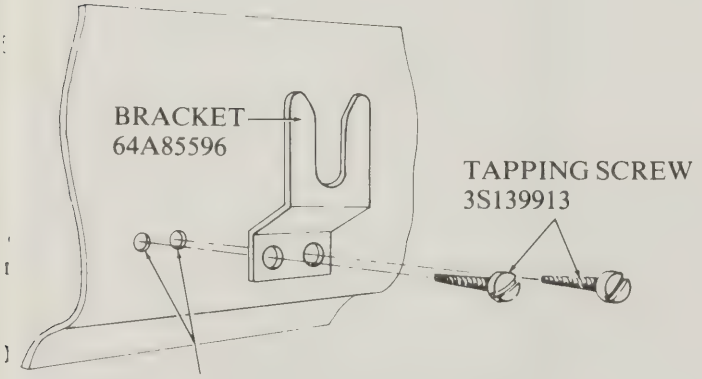
Do not dress the wires at this time but proceed with the radio set mounting procedure.

C. MICROPHONE HANGUP BOX (PL OR DPL MODELS)



Install hangup box lead pins to correspondingly numbered slots at the rear of the control head; lead labeled 24/30 should be installed into slot 30 for busy light radios with busy light control heads, into slot 24 for all other systems.

D. MICROPHONE HANGUP CLIP (CARRIER SQUELCH MODELS)



Drill 3.6 mm (0.144") holes in dashboard

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E. MICROPHONE

Step 1. Plug the microphone connector into the receptacle on the control head. Connect the S hook to the right hole of the strain relief plate.

Step 2. Hang the microphone in the hangup box or microphone clip.

THEORY OF OPERATION

1. GENERAL

Complete theory of operation for the "MITREK" radio is contained in the theory notes on the schematic diagram. These diagrams together with the functional block diagram provide all of the theory which an experienced technician will require to service the radio. Detailed theory of operation for those circuits unique to the "MITREK" radio is given in the following paragraphs.

2. METER 4 CIRCUIT

2.1 GENERAL

2.1.1 The Meter 4 circuitry allows the receiver channel elements to be warped on to the correct frequency using the same zero center meters used on radios with discriminators.

2.1.2 The circuit is basically a low frequency oscillator (approximately 30 Hz) that gates the receiver injection circuitry on and off while an on frequency carrier is being applied. The dc voltage at the output of the detector is sampled both when the channel elements are on (indicates actual carrier frequency) and when the channel elements are off (indicates desired i-f frequency). The difference between the two voltages indicates how far off frequency and in what direction the channel element is. When the two voltages are identical the channel element is on frequency.

2.2 DETAILED OPERATION

2.2.1 The low frequency oscillator consists of Q2 and Q3 which are wired as a Schmidt trigger and Q1 which also controls the receive switched 9.5 V. During normal receive operation, Q2 and Q3 will have no supply voltage and will be off. Q1 will be turned on and C1 will be charged via R2.

2.2.2 The Meter 4 circuit is activated whenever 9.5 volts is applied to Q2 and Q3. There are two conditions when 9.5 V is applied: (1) during a transmission and (2) when it is desired to set the receiver frequency.

2.2.3 The setting of the receiver frequency will be covered first. This sequence is initiated by shorting two pins together which applies regulated 9.5 volts to Q2 and Q3. Q2 is held off by the charge on C1, but Q3 turns on. The output of Q3 immediately goes high turning off Q1 which removes RX 9.5 volts. C1 will start discharging through R2 soon reaching a point where Q2 will turn on and Q3 turns off.

2.2.4 Q1 is allowed to turn on again recharging C1. When C1 charges high enough to turn Q2 off the entire sequence repeats itself. The end result is Q2, Q3 and Q2 oscillates at about 30 Hertz. The phase relationships are such that Q1 always turns off when Q3 turns on.

2.2.5 Whenever Q1 turns off, the receiver oscillator is disabled by the removal of the RX 9.5 volts. Q4 is turned on by REG 9.5 V through R13. C3 charges through Q4 and R14 to the dc voltage at the output of the detector buffer. This particular voltage is sampled when the oscillator (and thus the incoming carrier) is disabled.

2.2.6 Whenever Q3 turns off, Q1 turns on restoring the RX 9.5 volts enabling the receiver oscillator and the incoming carrier. When Q3 turns off it outputs a negative going pulse to Q4 via C2 and Q4 temporarily turns off. With Q4 off C3 either charges or discharges to the dc voltage now at the detector buffer.

2.2.7 When a transmission occurs, the push-to-talk circuit activates the TX 9.5 V which is applied to Q2 and Q3. The circuit does not oscillate though because the secondary push-to-talk line clamps the input of Q3 low and Q3 remains turned on for the duration of the transmission. Q3 in turn keeps Q1 turned off disabling the RX 9.5 volts. Thus part of the Meter 4 circuit is used to disable the receiver when transmitting.

3. POWER CONTROL AND PROTECTION CIRCUIT

3.1 GENERAL

3.1.1 The power control and protection circuit protects the rf power amplifier from overcurrent and overtemperature by reducing the drive during these conditions. In addition, it limits the maximum amount of drive that may be developed during undercurrent conditions such as when a driver or final device is faulty or during certain high VSWR conditions. Last, the protection circuit has a 15 ms turn-on delay to delay the generation of rf during antenna switching.

3.1.2 The circuitry may be separated into two portions. A regulation loop has control during normal operation and senses overcurrent and/or overtemperature. A drive limit loop limits the maximum drive when the power amplifier current drops below the operating point of the regulation loop.

3.2 DRIVE LIMIT LOOP

3.2.1 The limit loop, consisting of U901, Q903 and Q904, acts as a limiter for the variable control

MITREK

RADIO AND CONTROL HEAD
INSTALLATION PROCEDURE

RADIO SET MOUNTING

Step 1. Determine a location for the radio reasonably protected from dirt and moisture.

Step 2. Place the radio in the desired location and check for proper clearances as shown in the diagram at the right.

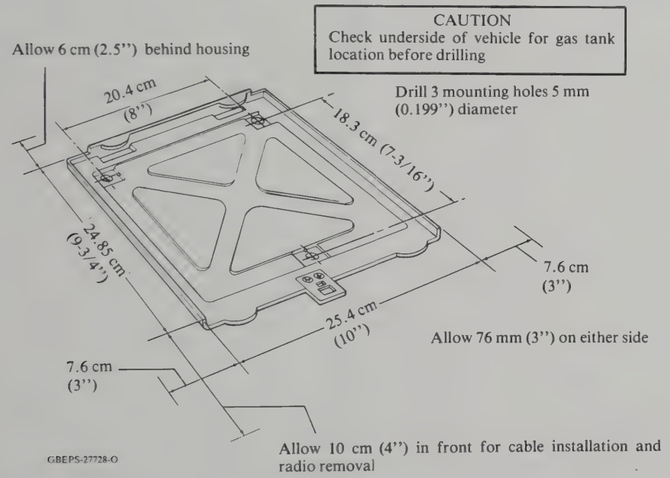
Step 3. Determine the exact mounting location and set the radio mounting plate in position. Using the mount ing plate as a template mark the location of the three mounting screw holes.

Step 4. Check underneath the vehicle to make sure that the drill and mounting screws will not encounter the gas tank, drive shaft, or other obstacles.

Step 5. Drill three 5 mm (0.199 inch) holes at the marked locations.

Step 6. Install the mounting plate with the three mounting screws provided. These screws are self- locking and require no lock washers or flat washers. An assortment of additional screws and spacers are provided for installing the mounting plate over extremely irregular surfaces.

Step 7. Install the radio per the instructions for radio set replacement on the other side of this sheet.



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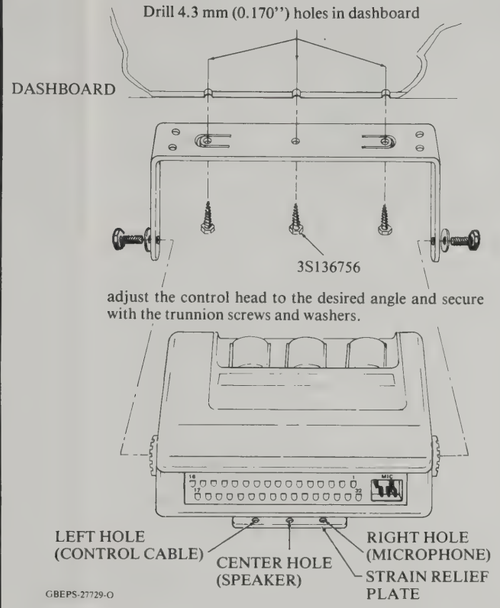
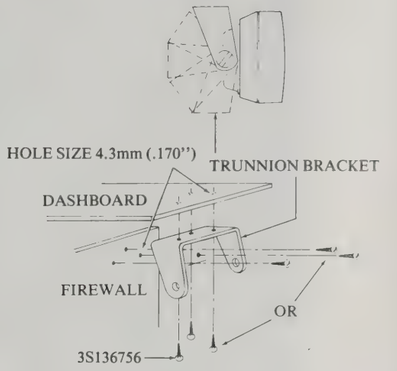
CONTROL HEAD, SPEAKER, AND ACCESSORIES

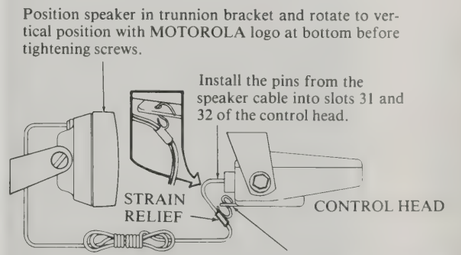
A. CONTROL HEAD



Install the pins from the control cable into correspondingly numbered slots on the radio cable connector at the rear of the control head; also the pin from the green (and orange if supplied) power lead. Connect the S hook on the control cable to the left hole in the strain relief plate.

B. SPEAKER





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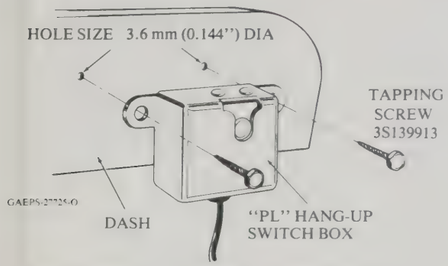

Install hangup box lead pins to correspondingly numbered slots at the rear of the control head; lead labeled 24/30 should be installed into slot 30 for busy light radios with busy light control heads, into slot 24 for all other systems.

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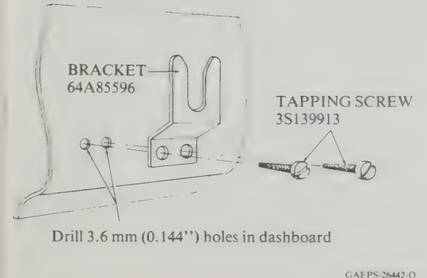

E. MICROPHONE

Step 1. Plug the microphone connector into the receptacle on the control head. Connect the S hook to the right hole of the strain relief plate.

Step 2. Hang the microphone in the hangup box or microphone clip.

POST-INSTALLATION CHECKOUT

Turn on the radio and perform a complete operational check. If ignition noise or alternator whine are noted refer to Motorola publication 68P81109E33—Reducing Noise Interference in Mobile Two-Way Radio Installations.

THEORY OF OPERATION

1. GENERAL

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2.2.2 The Meter 4 circuit is activated whenever 9.5 volts is applied to Q2 and Q3. There are two conditions when 9.5 V is applied: (1) during a transmission and (2) when it is desired to set the receiver frequency.

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2.2.4 Q1 is allowed to turn on again recharging C1. When C1 charges high enough to turn Q2 off the entire sequence repeats itself. The end result is Q2, Q3 and Q2 oscillates at about 30 Hertz. The phase relationships are such that Q1 always turns off when Q3 turns on.

2.2.5 Whenever Q1 turns off, the receiver oscillator is disabled by the removal of the RX 9.5 volts. Q4 is turned on by REG 9.5 V through R13. C3 charges through Q4 and R14 to the dc voltage at the output of the detector buffer. This particular voltage is sampled when the oscillator (and thus the incoming carrier) is disabled.

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2.2.7 When a transmission occurs, the push-to-talk circuit activates the TX 9.5 V which is applied to Q2 and Q3. The circuit does not oscillate though because the secondary push-to-talk line clamps the input of Q3 low and Q3 remains turned on for the duration of the transmission. Q3 in turn keeps Q1 turned off disabling the RX 9.5 volts. Thus part of the Meter 4 circuit is used to disable the receiver when transmitting.

3. POWER CONTROL AND PROTECTION CIRCUIT

3.1 GENERAL

3.1.1 The power control and protection circuit protects the rf power amplifier from overcurrent and overtemperature by reducing the drive during these conditions. In addition, it limits the maximum amount of drive that may be developed during undercurrent conditions such as when a driver or final device is faulty or during certain high VSWR conditions. Last, the protection circuit has a 15 ms turn-on delay to delay the generation of rf during antenna switching.

3.1.2 The circuitry may be separated into two portions. A regulation loop has control during normal operation and senses overcurrent and/or overtemperature. A drive limit loop limits the maximum drive when the power amplifier current drops below the operating point of the regulation loop.

3.2 DRIVE LIMIT LOOP

3.2.1 The limit loop, consisting of U901, Q903 and Q904, acts as a limiter for the variable control

voltage which is applied to the various exciter and power amplifier stages. Whenever the diode CR902 is reverse biased, the limit loop will go to a condition where the potentials at the inverting and non-inverting inputs to U901 are equal. The control voltage may be varied by R911, the Drive Limit control, which is part of a voltage divider in the feed back path from Q904 to U901. R911 is adjusted during initial alignment by watching a wattmeter and setting the power output about 10% above rated power. The control voltage output in this mode (when CR902 is reversed biased) represents the maximum amount of drive possible under any operating conditions.

3.2.2 Any time CR902 becomes forward biased and a higher potential is applied to the inverting input to U901, the limit loop is upset and the control voltage drops to some value lower than maximum drive. During normal opertion CR902 is forward biased by the regulation loop.

3.3 REGULATION LOOP

3.3.1 The regulation loop serves double duty as both a power regulator for the final amplifier and an overcurrent or overtemperature protection circuit. Q902 senses these input sources via CR901 and CR908. If, for any reason, any of these inputs go lower than normal the output of Q902 will go higher, the inverting input to U901 will go higher, and the control voltage output will go lower reducing the drive to the driver and final amplifier stages. The turn-on of CR902 is controlled by R909, the Power Set control, which is adjusted during alignment for rated power.

3.3.2 One input to CR901 and CR908 monitors the final current. The current drawn by the final amplifier must flow through R801, a low series resistance shunt, causing a slight voltage drop which will be applied to Q902 through R802. The second input to CR901 and CR908 monitors the PA deck temperature. If the temperature in the PA compartment exceeds approximately 95° C. RT801 decreases its resistance enough to allow the voltage, at R804, to forward bias CR801. The input to Q902 will again start to drop. Any low applied to Q902 will cause the output of Q902 to go higher. This will forward bias CR902, upsetting the limit loop, causing the control voltage output to be reduced.

3.4 OPERATION

The normal operating point is set by adjusting R909, the Power Set control, for the rated power output. At this point CR902 will be forward biased. The current drawn by the PA final amplifier flows through R801 and the voltage drop across R801 is applied to Q902. If the final current tries to increase, the input to Q902 will go lower, its output will go higher, the inverting input to U901 will go higher and the control voltage will go lower, reducing the drive level causing the final current to return to normal. If the PA current tries to decrease the opposite will take place. The input to Q902 will go higher, its output will go lower, the inverting input to U901 will go lower and the control voltage will go higher causing the PA current to return to normal. If for some reason the PA current cannot be brought up to normal, such as a PA failure, the output of Q902 will not change when the control voltage increases and CR902 will become reverse biased. When this happens the limit loop reverts to its limiting mode.

3.5 INITIALIZATION

3.5.1 When the radio is keyed, SEC PTT goes low allowing Q902 to saturate (C916 charging through the base-emitter junction of Q902 and R926 holds Q902 saturated). This forward biases CR902 which forces U901-2 high and pulls U901-6 low. Q903 and Q904 are cutoff and there is no drive applied to the control stages.

3.5.2 After 15 milliseconds, C916 has charged sufficiently through Q901 to reduce Q902 conduction reverse biasing CR902. This allows U901-2 to be pulled low and U901-6 goes high turning on Q903-Q904. As the power amplifier turns on, the voltage drop across R801 increases allowing Q902 to conduct harder. CR902 is again forward biased allowing the control voltage to be reduced to its adjusted value.

4. BRIDGE AUDIO CIRCUIT

4.1 The unique bridge audio circuit provides a highly efficient audio output. The circuit uses two differential power amplifiers which provide a balanced push-pull output to the speaker.

4.2 Audio is applied from the audio amplifier to the non-inverting input of U401. The output of U401 is applied to both one side of the speaker and to U402. R422 and R423 form a voltage divider that attenuates the high level output of U401 before it is applied to the inverting input of U402. The output of U402 is equal in amplitude to the output of U401 but 180°out of phase.

MAINTENANCE

1. GENERAL

1.1 The "MITREK" radio is designed for ease of access and servicing. The entire radio may be aligned from the top after removing the top cover. The radio is easily removable from the vehicle, and the entire solder side of the main circuit board can be accessed for troubleshooting by merely removing the four screws holding on the weatherproof bottom cover.

1.2 Full maintenance information for the radio is provided on the schematic diagram and the functional block diagram. The schematic diagram is highlighted with theory notes for each significant stage and has maintenance notes and ac signal levels distributed at key points in the circuit. These levels are also shown on the functional block diagram. The measurement points for the ac levels are keyed on the circuit board detail to allow rapid location and identification by the technician. DC voltages are provided on the schematic for most transistor leads.

2. RADIO DISASSEMBLY

2.1 REMOVAL OF RADIO SET FROM THE VEHICLE

An illustrated step-by-step procedure for removal and replacement of the radio is given on the Preinstallation Considerations pull-out page in this manual.

2.2 TOP AND BOTTOM COVER

An illustrated step-by-step procedure for removal and replacment of the top and bottom covers is given on the Preinstallation Considerations pull-out page in this manual.

2.3 OPTIONAL "PRIVATE-LINE"/"DIGITAL PRIVATE-LINE" BOARD

Removal of the board may be accomplished by removing four mounting screws and unplugging the board from J3 on the interconnect board. To replace the board reverse the removal procedure.

2.4 INTERCONNECT BOARD

Remove the "PRIVATE-LINE"/"DIGITAL PRIVATE-LINE" and time-out timer boards (if used). Remove one Phillips head screw from the mounting bracket, and two Phillips head screws, from the radio connector J1 on the front of the chassis. Slightly lift the board, tilt it toward the rear, and lift it out of the chassis. Replacement may be accomplished by reversing the removal procedure, taking care that J2 is properly seated into P2, on the main board.

2.5 RF DECK

To remove the rf deck, first unsolder the mixer shield and the four interconnections and ground straps from the main board. Unplug the exciter filter output and rf deck input connectors, then remove the rf deck from the bottom of the chassis. To replace the rf deck reverse the removal procedure.

NOTE

If optional preamplifier is used it must be removed before rf deck removal.

2.6 RF PREAMPLIFIER

2.6.1 To remove the preamplifier assembly, unplug the preamplifier rf input, output and power connectors. Remove two preamp mounting screws and remove preamp housing from the bottom of the chassis. To replace the preamp reverse this procedure.

2.6.2 The preamplifier board cannot be removed from the housing. All components can be replaced from the top of the board.

2.7 HARMONIC FILTER

2.7.1 30/50 Watt Models

Carefully unsolder the input lead from the PA board. ***To prevent damage to the harmonic filter, the input lead and mounting hole must be clear of solder.*** Remove two hex head mounting screws and lift the harmonic filter out of the chassis. To replace the harmonic filter reverse the removal procedure.

2.7.2 75/100 Watt Models

Remove the two hex mounting screws securing the top cover and corrugated gasket. Unsolder the coax cable at the power amplifier output. Straighten the cable *carefully* and lift the filter out of the casting. To replace the harmonic filter reverse the removal procedure taking special care that the side wall finger strips properly contact the filter bracket and that the corrugated gasket is correctly oriented.

2.8. ANTENNA SWITCHING RELAY

2.8.1 The antenna switching relay may be removed after unsoldering the two leads to the relay coil and unsoldering and removing the coax cable from the harmonic filter output. To release the harmonic filter cable, remove the harmonic filter (refer to paragraph 2.7. Note that a service loop is provided and it is not necessary to unsolder the cable in the power amplifier compartment. (High power only).

2.8.2 Remove the locking nut with a spanner wrench (Motorola No. RSX4028A). To replace the antenna switching relay, reverse the removal procedure.

2.9 MAIN BOARD

To remove the main board, remove the "PRIVATE-LINE"/"DIGITAL PRIVATE-LINE" board, time-out timer board, interconnect board, and the rf deck. Unsolder the wiring to the antenna relay, and to the six feedthru capacitors. Remove five transistor mounting screws from the chassis walls, and five main board mounting screws. Remove the main board from the bottom of the chassis. To install the main board reverse the removal procedure, taking care to replace insulators and shoulder washers so that the five transistor tabs are not shorted to the chassis wall.

3. POWER AMPLIFIER (30/50 W)

3.1 TRANSISTOR REPLACEMENT

3.1.1 To remove the transistors remove the mounting screws, unsolder and remove the clamped mica capacitors, unsolder and remove the transistors. (Special tips ST1160, and ST1161 are available from MOTOROLA Parts Department to aid in the capacitor and transistor removal). Before installing the new transistors apply light coating of Wakefield compound to mounting surface. Mount the transistors with the collector lead marked C facing the proper direction.

CAUTION

The transistor mounting screws must be tightened before the transistor tabs are soldered. *Do not tighten the mounting screws more than 6-7 inch pounds or damage to the transistor may result.*

3.1.2 Solder the transistor tabs to the circuit board so that the connection covers the entire surface of the leads. Resolder the clamped mica capacitors re moved earlier.

3.2 RF POWER AMPLIFIER BOARD REMOVAL

3.2.1 Under normal maintenance conditions there should be no need to remove the PA board. All components may be replaced from the top of the circuit board. If, however, replacement becomes necessary the following procedure should be followed. Unsolder six feedthru capacitors, and the harmonic filter input lead.

CAUTION

Damage to the harmonic filter will result if the input lead and mounting hole are not cleared of solder.

3.2.2 Unsolder and remove the input coax cable. Remove four transistor mounting screws (30 watt PA) or remove six transistor mounting screws and one 5/16" stud nut (50 watt PA). Remove seven hex head mounting screws. Lift board out of the chassis.

3.2.3 To replace the board, reverse the removal procedure. PA power transistors should be installed after the circuit board installation is complete. Refer to paragraph 3.1.

4. POWER AMPLIFIER (75/100 W)

4.1 TRANSISTOR MODULE REPLACEMENT

NOTE

Transistors are replaced as part of a module assembly. There are six module assemblies in each power amplifier; low level amplifier (control stage), pre-driver, driver, and three finals.

4.1.1 To remove the low level amplifier (control stage), unsolder the input coax, output strap, and the bias pin. Using C805 as a handle, carefully pull up on the module until Q802 is released from its head sink clip. Before installing a new module, apply a light coating of Wakefield compound to Q802. Care must be exercised in installing the new module to avoid breaking the substrate. When Q802 is aligned with the heat sink clip, apply pressure to Q802 only until the module is firmly seated.

4.1.2 To remove any of the other modules, unsolder the tabs from the ceramic substrates (8 tabs on pre-driver and driver modules and 6 on each of the final stage modules). Remove transistor mounting screws and extract module. Before installing the new module apply a thin coating of Wakefield compound to the mounting surface. Be sure that the module output (as indicated by the beveled corner) is facing the proper direction.

CAUTION

The transistor mounting screws must be tightened before the transistor tabs are soldered to the circuit board. *Do not tighten more than 6-7 inch pounds, or damage to the transistor may result.*

Solder the module tabs to the substrate so that the connection covers the entire surface of the tab.

4.2 RF POWER AMPLIFIER AND A + DISTRIBUTION BOARD REMOVAL

4.2.1 Unless access to the A+ distribution board is required, there should be no need to remove the power amplifier assembly. If access is required, the following procedure should be followed:

Step 1. Unsolder bias pin connections from the substrates (total of 7).

Step 2. Unsolder input and output coaxial cables.

Step 3. Remove 10 transistor mounting screws.

Step 4. Remove 5 hex head screws holding the plastic carrier.

Step 5. Remove amplifier (note special precautions in paragraph 3.1.1).

If it is necessary to remove the A+ distribution board, unsolder the 7 feed-thru capacitor connections and remove the 3 mounting screws.

4.2.2 To replace the boards, reverse the removal procedure. When replacing the power amplifier assembly note the special handling of the low level amplifier (paragraph 4.1.1). Apply a thin coating of Wakefield compound to the transistor mounting surfaces. Start transistor mounting screws to insure proper alignment then insert and tighten the hex head screws in the plastic carrier. Tighten the transistor mounting screws.

5. POWER AMPLIFIER TROUBLESHOOTING

The troubleshooting procedures, which follow, are to be used for the 75/100-watt series of radios. Use conventional troubleshooting techniques when servicing the 30/50-watt series of radios. It is assumed that the exciter tuning has been checked and that performance tests have localized the problem to the power amplifier section of the radio set.

CAUTION

Due to the voltage requirements of the NPN transistors in the Class C stages all "ground plating" in the low level amplifier control stage, predriver, driver, and final amplifier microstrips is at A- potential and is "hot" with respect to chassis ground in positive ground vehicles. Caution must be used to prevent connection of ground plating on the Class C stages to chassis ground, either directly or by use of test equipment ground lead. *When troubleshooting these microstrips in a positive-ground vehicle and using ac operated test equipment, the amplifier ground must not be electrically connected to the ac line ground lead.*

5.1 VISUAL CHECKS

Inspect all transmitter microstrips for obvious physical defects such as broken leads, broken or disconnected components, cracked microstrips, or leached chip capacitors. Microstrip cracks are usually hard to see but can often be found by sliding the tip of a modeling knife or some other sharp object along the surface of the ceramic substrate. Usually, a noticeable "bump" will be felt as the sharp object passes over the crack in the microstrip. Slide the knife in both directions. An ohmmeter can also be used to locate cracks.

5.2 ANTENNA NETWORK CHECK

Step 1. Momentarily key the transmitter and note the power output while reading MTR 7. *If there is no power output,* and MTR 7 indicates that the final amplifier stage is drawing current, ***immediately*** unkey the radio set. Thoroughly check out the antenna network by carefully unsoldering the coaxial cable from the output of the final amplifier stage.

Step 2. Using an ohmmeter, check short or open caused by a faulty harmonic filter or antenna reed switch. Replace the faulty assembly (see procedure in paragraphs 2.7 and 2.8) and recheck the power output and the MTR 7 reading. If there is no (or low) power output and no MTR 7 indication, continue with the remainder of the troubleshooting procedure.

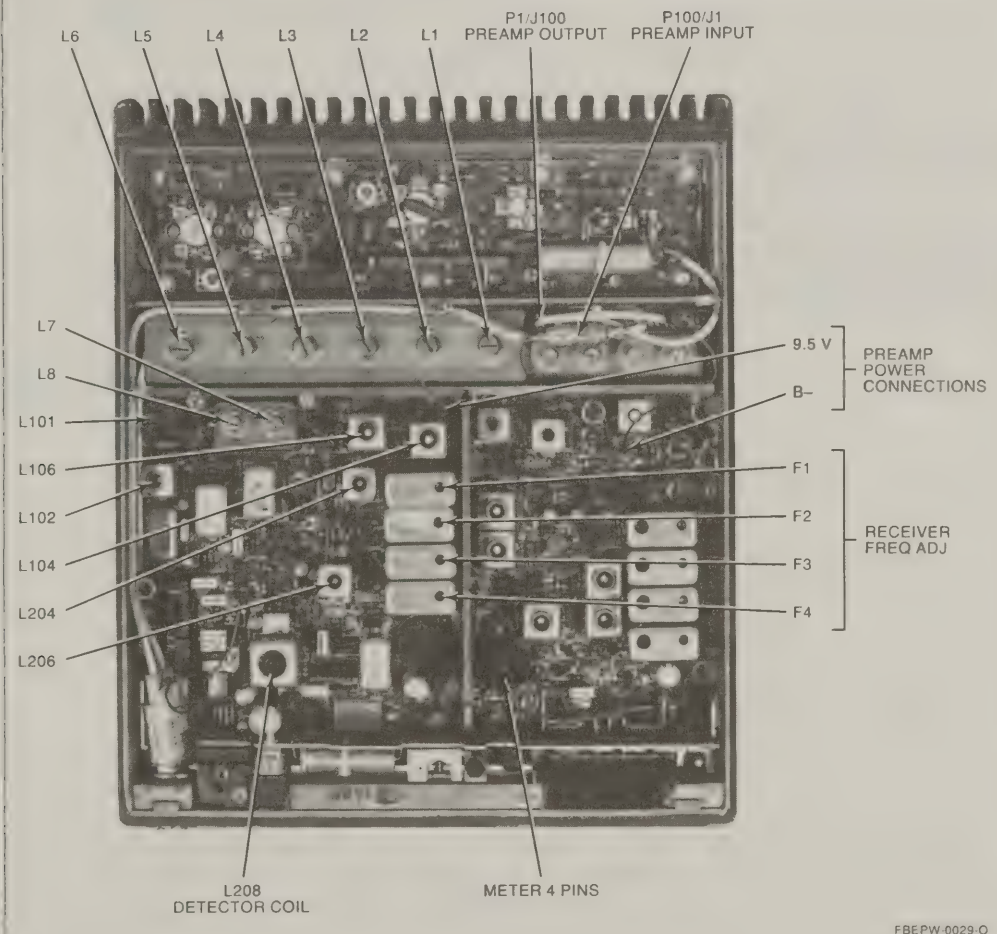
5.3 DC VOLTAGE CHECKS

Step 1. Check the voltage between the C884 A+ feed-thru capacitor (red lead) and the C885 A- feed-thru capacitor (black lead). If the voltage is not the same as the battery voltage, check the cabling.

Step 2. Measure the dc voltage at the collectors of the final amplifier (Q805-Q807) with respect to A- on the power amplifier. The readings should be greater than 12 volts with the transmitter keyed or unkeyed. If not, check R801 (located on the power distribution board), the A+ collector feed coils, the feed pins, and the combiner substrate for continuity.

Step 3. Similarly, check the dc voltages at the collectors of Q803 and Q804. The readings should be greater than 12 volts. If not, check the A+ collector feed coils, the feed pins, the substrates, and the power distribution board for continuity.

Step 4. The low level amplifier operates from a controlled voltage supplied by the power control circuitry. This voltage normally varies between approximately 3 volts and 10 volts. Set potentiometers R813, R909, and R911 maximum clockwise. Key the transmitter and check the control voltage at the collectors of Q801 and Q802. If the readings are less than 10 volts, check the collector feed coils, the feed pins, the low level amplifier substrate, and the power distribution board for continuity shorts. If these checks fail to isolate the problem, proceed to paragraph 5.4.



Receiver Adjustment Points

REQUIRED TEST EQUIPMENT FOR "MITREK" RADIO SERVICING

General Type	Application	Recommended Model	Minimum Specifications
AC-DC VOM	DC voltage measurements, general	Motorola T1009A	Measurement range: 0-15 V dc Sensitivity: 20,000 ohms/volt
DC Multimeter	DC voltage readings requiring a high input resistance meter	Motorola S1063B	Measurement range: 0-15 V dc Input resistance: 11 megohms
AC Voltmeter	Audio voltage measurements	Motorola S1053C	Measurement range: 0-10 V ac Input resistance: 10 megohms
RF Voltmeter	RF voltage measurements	Motorola S1339A	Measurement range: 100 uV-3 V from 1 MHz-512 MHz Inputs: 50 ohm and high impedance
Oscilloscope	Waveform observation	Motorola R1004A	Vertical sensitivity: 5 mV - 10 V/division Horizontal time base: 0.2 usec. 0.5 sec/division
RF Wattmeter	Transmitter output power measurement	Motorola S1350A with appropriate element and T1013A RF Dummy Load	Measurement range: 0-50 Watts, 0-100 Watts
Frequency Meter	Transmitter frequency measurement	Model R1200A Service Monitor with high stability oscillator (X suffix) option. Frequency calibration recommended every 6 months or less.	Measurement range: 1-512 MHz Frequency resolution: 10 Hz
Deviation Meter	Transmitter modulation deviation	Motorola R1200A Service Monitor	Measurement range: 0-10 kHz deviation Frequency range: 406-512 MHz
RF Signal Generator	Receiver alignment and troubleshooting	Motorola R1200A Service Monitor with attenuator	Frequency range: 406-512 MHz Output Level: 0.1 uV-100,000 uV Must be capable of at least ±3 kHz deviation when modulated by 1 kHz tone.
Audio Signal Generator	Audio circuit troubleshooting	Motorola S1067B	Frequency range: 20 Hz-20 kHz Output Level: 50 mV-1 V
PL Tone Generator*	Tone-Coded "Private-Line" Decoder Troubleshooting	Motorola S1333B	Frequency range: 10 Hz-9999 Hz Output level: 0-3 V rms
DPL Test Set**	"Digital Private-Line" Encoder-Decoder Troubleshooting	Motorola SLN6413A	
Radio Test Set w/appropriate metering cable SKN6012B	Meter readings at circuit metering points for alignment and troubleshooting	Motorola S1056B Portable Test Set, TEK5B- E Metering Panel with RPX4053A Conversion Kit, or TEK5F Metering Panel.	
Tuning Tool Kit	Receiver and transmitter alignment	Motorola HLN4023A	
DC Power Supply	DC power for shop service	Motorola R1011AA	1-20 V DC 0-40A

*Required for tone-coded "Private-Line" models only.
**Required for "Digital Private-Line" models only.

NOTE

If version B through E of the TEK-5 Portable Test Set are used ***they must first be modified*** using RPX4053A Conversion Kit.

FREQUENCY CALCULATIONS

FREQUENCY	CALCULATION
406-420 MHz 450-512 MHz	$f_O = \frac{f_C - 10.7}{9}$

Where f_O = crystal frequency, f_C = carrier frequency

POSITIVE GROUND SYSTEMS

CAUTION

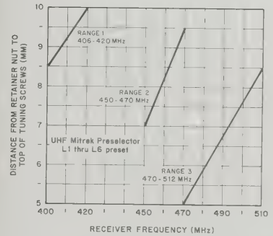
In positive ground systems the case of the TEK-5 Meter Panel and portions of the S1056B Portable Test Set are hot with respect to the vehicle chassis due to the nature of the positive ground installation. Take necessary precautions that the test equipment does not contact the vehicle chassis.

UHF "MITREK" RECEIVER ALIGNMENT PROCEDURE

1. To perform this tuning procedure, use either the Motorola portable test set or the TEK-5 on Position A. When using the TEK-5F or modified TEK-5B through modified TED-5E meter panels, put the M1, 2 polarity switch in the reverse position and ignore the polarity notes.
2. F_L is the lowest receive frequency; F_H is the highest. For single-frequency radios, $F_L = F_H$.
3. IMPORTANT: When using the Motorola portable test set for M4, put the FUNCTION SELECTOR SWITCH in the proper position for M4 operation.

Step	Test Set Meter Position	Adjust	Procedure
1.		L1-L6	Preset the RF preselector tuning screws per the preset chart.
2.		L7-L8	Preset the injection filter tuning screws 15mm (9/16 inch) above the retainer nuts.
3.		L104, L106	Preset the L104 and L106 coil slugs 13 turns below flush with the top of the coil form.
4.		L101	Preset the mixer gate coil slug to the bottom of the coil form. This is a final adjustment. (The 470-512MHz radio does not have L101.)
5.		L102	Preset the mixer drain coil slug 15 turns below flush with the top of the coil form.
6.		L204, L206	Preset the IF matching network coil slugs 8 turns below flush with the top of the coil form.
7.	2 (reverse)	L208	Starting with the slug flush with the top of the coil form, screw it in until Meter 2 **first** reads 24 uA. (No input signal is necessary).
8.*	6	L104, L106	Set the frequency selector to F_L. Starting with L104, alternately adjust the injection buffer coils ½ turn at a time *clockwise* until Meter 6 moves. Then adjust L104 and L106 for a peak reading on Meter 6. Check for multiple peaks and adjust for the highest peak.
NOTE: For single-frequency radios and for multiple-frequency radio with F_H-F_L less than or equal to 1 MHz, perform Steps 9-11. For multiple-frequency radios with F_H-F_L greater than 1 MHz, perform Steps 12-16.			
9.*	6	L104	For single-frequency radios, or if the Meter 6 reading on F_H is higher than on F_L, go to Step 10. Otherwise, adjust L104 so that the reading on Meter 6 is *balanced* between F_L and F_H. Repeat Step 9 until the *highest* possible *balanced* reading is obtained.
10.*	6	L7	Set the frequency selector to F_L. Adjust L7 *clockwise* for a *peak* on Meter 6.
11.*	6	L8	Adjust L8 *clockwise* for a *dip* on Meter 6. Go to Step 17.
*Do NOT repeat Steps 8 and 9 (L104, L106) after doing Step 10 (L7). Do NOT repeat Step 10 after doing Step 11 (L8).			
12.†	6	L104	If the Meter 6 reading on F_H is higher than the Meter 6 reading on F_L, go to Step 13. Otherwise, adjust L104 so that the reading on Meter 6 is *balanced* between F_L and F_H. Repeat Step 12 until the *highest* possible *balanced* reading is obtained.
13.†	6	L7	Set the frequency selector to F_L. Adjust L7 *clockwise* for a *peak* on Meter 6.
14.†	6	L7	Adjust L7 *counterclockwise* for a 2 uA *reduction* in the Meter 6 reading.
15.†	6	L8	Adjust L8 *clockwise* for *a dip* on Meter 6.
16.†	6	L8	Adjust L8 *counterclockwise* for a 1 uA *increase* in the Meter 6 reading.
†Do NOT repeat Step 12 (L104, L106) after doing Step 13 (L7). Do NOT repeat Steps 13 and 14 after doing Step 15 (L8).			
17.	1 (Reverse)	L1-L6	Set the rf generator to the F_L carrier frequency (± 100Hz) and adjust the output level for 35 uA on Meter 1. Adjust L1 through L6 in order *clockwise* for a peak reading on Meter 1. While making this adjustment, adjust the rf signal generator output to maintain Meter 1 between 30 and 40 uA. (If you cannot obtain a Meter 1 reading between 30-40 uA initially, adjust L1 through L6 ½ turn clockwise. Repeat this until Meter 1 reads 30-40 uA. Then complete Step 17.)
18.	1 (Reverse) 4	Receiver Oscillator Warp	For each frequency: Set the rf generator to the carrier frequency (± 100Hz) and adjust the output level for a Meter 1 reading of 35 uA. Activate the Meter 4 circuit by shorting the Meter 4 enable pins. Adjust the oscillator frequency for a zero reading on Meter 4.
19.	1 (Reverse)	L102, L204, L206	Set the rf signal generator to F_L, apply standard test modulation (1 KHz tone, ± 3 KHz deviation) to the generator, and adjust the output level for 35 uA on Meter 1. Adjust the IF coils for a *peak* reading on Meter 1 while maintaining Meter 1 between 30 uA and 40 uA by adjusting the generator output. Repeat until there is no further improvement.
20.	7 (AC voltmeter across the speaker)	L208	With the same conditions as in Step 19, adjust L208 slowly for *maximum* audio voltage across the speaker.
21.	1 (Reverse)	L1-L6	If F_H is 400-460 MHz or 470-494 MHz, adjust L1 through L5 ¼ turn *counterclockwise* and L6 ½ turn *counterclockwise*. If FH is 460-470 MHz or 494-512 MHz, adjust L1 through L5 ½ turn *counterclockwise* and L6 one turn *counterclockwise*
22.	1 (Reverse)	L1-L5	Set the frequency selector to F_L, remove the test modulation, and adjust the output level for 35 uA on Meter 1. Adjust L1 through L5 *in order* clockwise for a peak reading on Meter 1 while maintaining Meter 1 between 30 uA and 40 uA by adjusting the rf signal generator output. Do NOT repeat this step without having repeated Steps 1, 17, and 21 first.
23.	(AC voltmeter across the speaker)	L6	For single-frequency radios, or if F_H-F_L is less than or equal to 1.8 MHz, adjust L6 for best quieting on F_L. If F_H-F_L is greater than 1.8 MHz, adjust L6 for best *balanced* quieting between F_L and F_H.
24.	1 (Reverse) 4	Receiver Oscillator Warp	Repeat Step 18

Receiver alignment is complete.



NOTE:
The tuning procedure is written for use with the Motorola portable test set. If using the Tek5-F or modified Tek5-B through Tek5-E meter panels, put the M1,2 polarity switch in the reverse position and ignore the indicated polarity notes.

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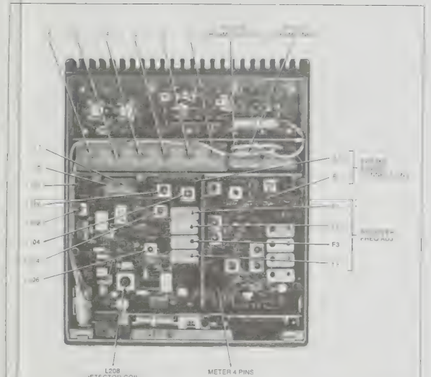
Positions of Tuning Screws for Various Frequency Ranges

UHF "MITREK"

RECEIVER ALIGNMENT



Receiver Adjustment Points

Receiver Alignment Procedure
Motorola No. PEPS-26612-E
5-9-82 GGI

OSCILLATOR FREQUENCY ADJUSTMENT

ɔr "on frequency" should be done *after* the transmitter has been aligned, but *before* transmitter and set. To set the oscillator on frequency, perform the following steps:

frequency meter as described in the frequency meter instruction manual.

quency selector switch on the control head to the F1 position (multi-frequency units only).

ansmitter with no modulation using the portable test set. On "Private-Line" or "Digital Private-h models, disable the "Private-Line" encoder by shorting the code disable points on the "Private-ivate-Line" encoder/decoder board.

· T1 FREQ ADJ control for proper readings on the frequency meter. If the frequency as indicated ıeter is too low, turn the T1 FREQ ADJ control counterclockwise, if too high, turn the control equency to within ±225 Hz.

quency selector switch to the F2 position and repeat Step 4 using the T2 FREQ ADJ control.

p 4 for F3 and F4, respectively.

te-Line" or "Digital Private-Line" models, remove the short added in Step 3.

NOTE
Omit Steps 5 and 6 for single frequency units.

DEVIATION ADJUSTMENTS

NOTE
The oscillator frequency adjustment *must* be made *prior* to this adjustment.

he output leads of the tone oscillator through a .33 uF capacitor to the transmitter audio input acle).

ıe ac voltmeter across the same terminals and adjust the tone generator output to 1 volt at 1000 Hz.

requency selector switch in the F1 position (in multiple frequency models) and key the transmitter est set. Adjusting the T1 DEV ADJ control, for 4.8 kHz deviation as read on the deviation measur-. For multiple frequency models adjust the F2, F3, and F4 DEV controls with the frequency selec-responding position.

ine" tone deviation should be between 0.5 and 1 kHz.

FINAL METER READINGS

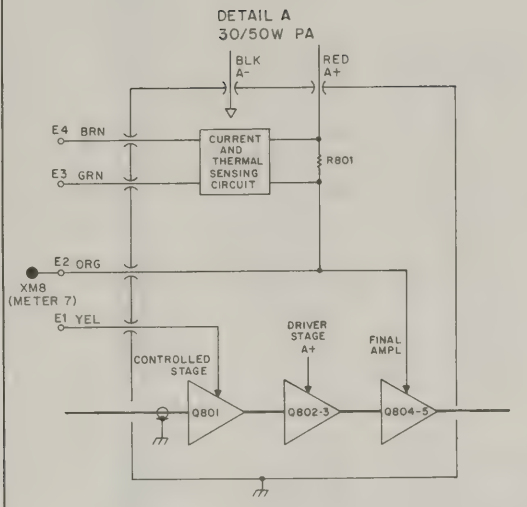
ısmitter is aligned or tested, final meter readings should be made and entered in a logbook.

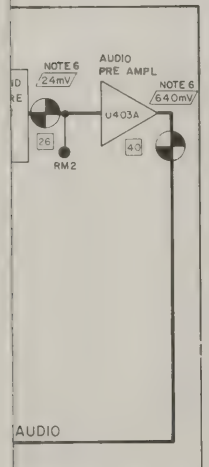
M3 and M5 are purely relative and do not give actual current or voltage measurements.

croampere scale reading obtained at M7 by 0.7 (30 W), 0.8 (50 W), or 1.1 (75/100 W) to determine amplifier current in amperes.

ITTER IS PROPERLY ALIGNED, METER DEFLECTIONS SHOULD FALL WITHIN THE LIMITS SHOWN IN

METER 3	METER 5	METER 6	METER 7
15 (min) 50 (max)	10 (min) 50 (max)	6 (min) 50 (max)	17 (max) 50 W or 100 W radios) 13 (max) 75 W radios)
Base of First Doubler	Base of Low Level Ampl	Input of Exciter Filter	Final Ampl Current





LEGEND

- XM3 METERING SOCKET PIN
  XM = TRANSMIT METERING SOCKET
  RM = RECEIVE METERING SOCKET
- RF ORAC VOLTAGE AT POINT INDICATED
- [21] LOCATION OF VOLTAGE OR WAVEFORM MEASUREMENT POINT. THESE POINTS ARE KEYED ON THE CIRCUIT BOARD DETAIL
- THEORY OF OPERATION DATA
- MAINTENANCE DATA
- PRIMARY SIGNAL FLOW
- B— (MAIN BOARD REF.)
- CHASSIS REF
- A— (PA REF.)

NOTES

1. JU1 ON INTERCONNECT BOARD IS REQUIRED ONLY IN INSTALLATIONS USING MOCOM 70/MOTRAC CABLE KITS. JU1 MUST BE OMITTED FROM INTERCONNECT BOARD IN POSITIVE-GROUND INSTALLATIONS USING MITREK CABLE KIT; IT MAY BE OMITTED IN NEGATIVE-GROUND INSTALLATIONS USING MITREK CABLE KIT.
2. JU3 NORMALLY OMITTED FROM INTERCONNECT BOARD. CLIP MAY BE INSTALLED AT POSITION A FOR MULTIPLE PL/DPL APPLICATIONS. CLIP MAY BE INSTALLED AT POSITION C FOR EXTERNAL SP INPUT TO MAIN BOARD PIN 16.
3. JU104 IS INSTALLED AND A HANGUP BOX WITH MONITOR SLIDE SWITCH USED IN PL/DPL SYSTEMS IF S103 IS USED FOR AN SP.
4. JU101 MUST BE OMITTED IF OPTIONAL ORANGE IGNITION SWITCH WIRE IS USED. WHEN THIS OPTION IS INSTALLED, TRANSMITTER USE REQUIRES IGNITION SWITCH TO BE ON; RADIO MAY BE USED IN RECEIVE-ONLY MODE WITH IGNITION SWITCH OFF.
5. VOLTAGES IN TRANSMIT AUDIO CIRCUIT MEASURED WITH A 1-VOLT, 1000-HZ SIGNAL INJECTED AT MICROPHONE CONNECTOR.
6. VOLTAGES IN RECEIVE AUDIO CIRCUIT MEASURED WITH VOLUME CONTROL SET TO PRODUCE 32 MV AT POINT [41] WITH RECEIVED CARRIER DEVIATED 3 KHZ WITH A 1000-HZ AUDIO TONE.
7. VOLTAGES IN RECEIVER I-F CIRCUITS MEASURED WITH 1-MV CARRIER INTO RADIO EXCEPT FOR MEASUREMENT POINT 20. POINT [20] MEASURED WITH A 10-MV CARRIER.
8. FOR BUSY-LIGHT RADIOS, HUB CONNECTS TO 30 INSTEAD OF 24.
9. JU905 IS OUT ON 75-100 W MODELS.
10. CR403, CR404, R431, and L401 ARE OMITTED WHEN BUSY-LIGHT OPTION IS USED. (WIRES FROM BUSY-LIGHT ADAPTER BOARD SOLDER TO HOLES NORMALLY OCCUPIED BY THESE COMPONENTS.)

UHF "MITREK"

TRANSMITTER ALIGNMENT

FREQUENCY	CALCULATION
406-420 MHz	f_c
450-512 MHz	$f_o = \frac{}{36}$

Where f_o = crystal frequency, f_c = carrier frequency.

CAUTION

Do not key the transmitter for more than a few seconds at a time until it is properly tuned. Turn on the transmitter for brief periods while reading the meter and making the adjustments.

Transmitter Alignment Procedure
Motorola No. PEPS-26613-E
5-9-82 GGI

UHF "MITREK" TRANSMITTER TUNING PROCEDURE FOR 75/100 WATT MODELS

1. The tune-up procedure has been written for use with the Motorola portable test set of the TEK-5 set to position A.
2. Start multi-frequency tune-ups at the lowest frequency.

Step	Test Switch Position	Adjustment	Procedure
1	None	L701-708*, L9-12, R909 R911, R813	Preset L702, L704, L705, L706, L707 and L708 to be flush with top of can. Set L701 and L703 7 turns in from top of can. Set L9-12 1/4 inch (6 mm) above filter casting. Set R909 and R813 fully clockwise. Set R911 at mid rotation.
2	M3	L701-703	Peak L702, then peak L701, L702, and L703.
3	M3	L704, L705	Dip L704, then peak L705.
4	M5	L706, L707, L704, L705	Peak L706, L707, L704, and L705 in that order.
5	M6	L708*	Peak L708* for peak that is closest to bottom of coil. Peak should occur close to a *dip* MTR5.
	For wide-space operation, go to Step 12.		
6	M6	L9-11	Turn counterclockwise and dip L9, peak L10, and dip L11.
7	M7	L12	Turn counterclockwise and peak L12. *If no MTR 7 indication is observed,* preset L9, L10, L11, L12 (Step 1) and go back to Step 6. *If definite peak of L12 cannot be obtained,* rotate R911 counterclockwise until MTR 7 drops to 15 uA or maximum counterclockwise position and repeak L12.
8	M6	L708*	Peak L708*.
9	M7	R911	Rotate 911 fully clockwise and note MTR 7. Rotate R911 counterclockwise until MTR 7 drops by 1 uA. *If no change is observed,* set R911 fully counterclockwise.
10	Wattmeter	R813	Rotate R813 until power output decreases to 120 W *for 100 W, 406-420 MHz, 450-470 MHz operation,* or 100 W *for both 75 W 406-420 MHz, 450-512 MHz operation and 200 W (ERP) 470-512 MHz operation. If output power is less than, or equal to, required set power before adjustment,* rotate R813 until power just begins to drop.
11	Wattmeter	R909	Set R909 to 110 W *for 100 W 406-420 MHz, 450-470 MHz operation,* or 83 W *for 75 W 406-420 MHz, 450-470 MHz operation,* or 86 W *for 200 W (ERP) 470-512 MHz operation or 65 W for 150 W (ERP) 470-512 MHz operation.*
	This completes the alignment for single frequency radios, For multi-frequency radios, perform the following steps.		
12	M3	L701, L703 on *highest*	Peak L701, L703 on *highest* frequency.
13	M3	L702	Peak L702 on lowest frequency.
14	M5	L706, L707, L704	Peak L706, L707 for highest peak on *highest* frequency. If meter 5 is less than 10, balance M5 between lowest and highest frequency using L704 and L706.
15	M6	L708*	Peak L708* on peak closest to bottom of coil on *highest* frequency.
16	M6	L9-11	Turn counterclockwise and dip L9, peak L10, and dip L11 on *highest* frequency. (L9 may have a shallow dip.)
17	M7	L12	Peak L12 on *highest* frequency. *If no MTR 7 indication is observed,* preset L9, L10, L11, L12 (Step 1) and go back to Step 16. *If definite peak of L12 cannot be obtained,* rotate R911 counterclockwise until MTR 7 drops to 15 uA or maximum counterclockwise position and repeak L12.
18	M6	L708*	On the *lowest* frequency, peak L708* on peak closest to bottom of coil.
19	M7	On the lowest frequency, L10, L11	Turn L10, L11 clockwise 45 ° (1/8 turn). *If no MTR 7 is shown,* then preset L9, L10, L11, L12 (Step 1) and go back to Step 16. If required, go back to Step 1.
20	M7	R911	Rotate R911 fully clockwise and note MTR 7 for all transmit frequencies. At frequency of highest MTR 7 reading, rotate R911 for a 1 uA drop in MTR 7. *If MTR 7 has dropped by more than 1 uA for any other frequency,* use frequency of greatest drop to readjust R911 for a 1 uA drop in MTR 7.
21	Wattmeter	R813	On the *lowest* frequency, rotate R813 for a power output of 120 W *for 100 W, 406-420 MHz, 450-470 MHz operation,* or 100 W *for both 75 W, 406-420 MHz, 450-512 MHz operation, and 200 W (ERP) 470-512 MHz operation. If power output is less for any other transmit* frequency, use frequency of lowest power output to readjust R813. *If power output is less than required before adjusting R813,* adjust R813 until power output just begins to drop.
22	Wattmeter	R909	Set R909 to 110 W *for 100 W 406-420 MHz, 450-470 MHz operation,* or 83 W *for 75 W 406-420 MHz, 450-470 MHz operation,* or 86 W *for 200 W (ERP) 470-512 MHz operation, or 65 W for 150 W (ERP) 470-512 MHz operation.* Check all transmit frequencies to ensure no more than ± 8 W change *for 110 W set,* or ± 6 W *for 65 W, 83 W or 86 W set.* Readjust R909, if required, to maintain readings within these limits.

*L708 is tuneable only in 450-512 MHz radios .

UHF MITREK TRANSMITTER TUNING PROCEDURE FOR 30/50 WATT MODELS

1. The tune-up procedure has been written for use with the Motorola portable test set or the TEK-5 set to position A.
2. Start multi-frequency tune-ups at the lowest frequency.

Step	Test Set Switch Position	Adjustment	Procedure
1	None	L701-708*, L9-12, R909, R911, C800, C813*	Adjust L702, L704, L705, L706, L707 and L708* to be flush with top of can. Set L701 and L703 seven turns in from top of can. Set L9-L12 1/4 inch (6mm) above filter casting. Set R909 fully clockwise, R911 180° from fully counterclockwise or 90° from fully clockwise. Set C800, C813* 1/2 turn from tight.
2	M3	L702, L701, L702, L703	Peak L702, then peak L701, L702, L703
3	M3	L704, L705	Dip L704, then peak L705.
4	M5	L706, L707, L704, L705	Peak L706. L707, L704, L705 in that order.
5	M6	L708*	Peak L708* for peak that is closest to bottom of coil. Peak should occur close to a dip in meter 5.
	For wide-space operation, go to Step 13.		
6	M6	L9, L10, L11	Turn counterclockwise and dip L9, peak L10 and dip L11.
7	M7	L12	Peak L12. If no MTR 7 is observed, then preset L9, L10, L11, L12 and go back to Step 6.
8	M7	C813*	Peak C813*
9	M6	L708*	Peak L708*
10	Wattmeter	C800, R911	Peak C800. If 65 W (50 W radio) or 38 W (30 W radio) is not obtained, then increase R911 until the required power is obtained or no further increase is noted. If power is less than 55 W (50 W radio) or 36 W (30 W radio), then preset L9, L10, L11, L12, L708* and go back to Step 5. If necessary, go back to Step 1.
11	Wattmeter	R911, C813*	Set R911 to 65 W (50 W radio), 38 W (30 W radio), or to power level in Step 10. Retune C813*. Reset R911 if necessary.
12	Wattmeter	R909, C800	Set R909 for 55 W (50 W radio) or 34 W (30 W radio) and peak C800. Reset R909 if necessary.
	This completes alignment for single frequency radios. For multi-frequency radios, complete the following steps.		
		NOTE	
		F_L = Lowest transmitter frequency.	
		F_H = Highest transmitter frequency.	
13	M3	L701, L703	On F_H: Peak L701, L703
14	M3	L702	On F_L: Peak L702.
15	M5	L704, L706, L707	On F_H: Peak L706, L707. If M5 is less than 10, balance M5 between lowest and highest frequency using L704 and L706.
16	M6	L708*	On F_H: Peak L708* on peak closest to bottom of coil.
17	M6	L9, L10, L11	On F_H: Turn counterclockwise and dip L9, peak L10, dip L11 (L9 may have shallow dip).
18	M7	L12	On F_H: Peak L12, if no indication, preset L9, L10, L11, L12 and go back to Step 17.
19	M7	C813*	On F_H: Peak C813*.
20	Wattmeter	C800	On F_H: Peak C800. If power is less than 65 W (50 W radio) or 38 W (30 W radio), then increase R911 until the power is obtained or until no further increase in power is noted. If power is less than 55 W (50 W radio) or 36 W (30 W radio), then preset L9, L10, L11, L12, L708* and go back to Step 16. If needed go to Step 1.
21	M6	L708*	On F_L: Peak L708* on lowest frequency on peak closest to bottom of coil.
22	M7	L10, L11	On F_L: Turn L10, L11 clockwise in 45° (1/8 turn). If no MTR 7 is shown, then preset L9, L10, L11, L12 and go back to Step 17. If needed go to Step 1.
23	M7	C813*	On F_L: Peak C813*.
24	Wattmeter	C800, R911	Peak C800. Set R911 to 65 W (50 W radio) or 38 W (30 W radio), or to the same power obtained in Step 20. If the difference in power between all channels is less than or equal to 5 W (50 W radio) or 3 W (30 W radio), go to Step 25; if not, then go to Step 26.
25	Wattmeter	C800, R909	On lowest power channel, set R909 to 55 W (50 W radio) or 34 W (30 W radio) and repeak C800. Reset R909 if necessary. A balance of C800, may be necessary to achieve difference of less than 5 W (50 W radio) or 3 W (30 W radio). If the required balance cannot be achieved, then reset R909 full clockwise, and go to Step 26.
	Perform Step 26A if there is a difference of 5-8 W between any two channels. Perform Step 26B if the power difference between any two channels is greater than 8 W.		
26A	Wattmeter	C800, C813*	Balance power on all channels. R911 may have to be turned down to the proper power output. If balance cannot be achieved, go to Step 26B.
26B	Wattmeter	L9, L12	Balance power on all channels. Balancing of L9, L12 should not degrade the output power, of the channel having the highest output power, (as obtained in Step 26A), by more than 2W. If balance cannot be achieved, go to Step 26C.
26C	Wattmeter	L10, L11	On the lowest power channel, tune L10, L11 slightly (less than 1/8 turn). For an increase in power, go back to Step 26B.
	Once the required balancing is achieved, go to Step 25. If proper balancing cannot be obtained, preset R911, L708* L9-12, and go to Step 16.		

*C813 adjustments apply only to 50 W (450-512 MHz) radios. L708 is tuneable only in 450-512 MHz radios.

NOTE

L9-L12 should be all about the same height when properly tuned.

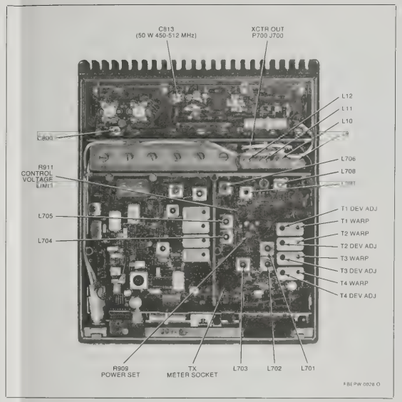


Figure 1. Transmitter Control Locations for 30/50 Watt Models

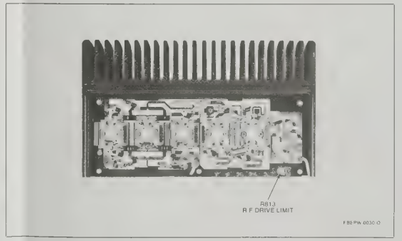


Figure 2. Power Amplifier Control Locations for 75/100 Watt Models

OSCILLATOR FREQUENCY ADJUSTMENT

Setting the oscillator "on frequency" should be done *after* the transmitter has been aligned, but *before* transmitter deviation is checked and set. To set the oscillator on frequency, perform the following steps:

Step 1. Set up the frequency meter as described in the frequency meter instruction manual

Step 2. Set the frequency selector switch on the control head to the F1 position (multi-frequency units only)

Step 3. Key the transmitter with no modulation using the portable test set. On "Private-Line" or "Digital Private-Line" coded squelch models, disable the "Private-Line" encoder by shorting the code disable points on the "Private-Line" or "Digital Private-Line" encoder/decoder board.

Step 4. Adjust the T1 FREQ ADJ control for proper readings on the frequency meter. If the frequency as indicated on the frequency meter is too low, turn the T1 FREQ ADJ control counterclockwise, if too high, turn the control clockwise. Set the frequency to within ± 225 Hz

Step 5. Set the frequency selector switch to the F2 position and repeat Step 4 using the T2 FREQ ADJ control

Step 6. Repeat Step 4 for F3 and F4, respectively

Step 7. On "Private-Line" or "Digital Private-Line" models, remove the short added in Step 3

NOTE

Omit Steps 5 and 6 for single frequency units.

DEVIATION ADJUSTMENTS

NOTE

The oscillator frequency adjustment *must* be made *prior* to this adjustment

Step 1. Connect the output leads of the tone oscillator through a .33 uF capacitor to the transmitter audio input (microphone receptacle)

Step 2. Connect the ac voltmeter across the same terminals and adjust the tone generator output to 1 volt at 1000 Hz

Step 3. Place the frequency selector switch in the F1 position (in multiple frequency models) and key the transmitter using the portable test set. Adjusting the T1 DEV ADJ control, for 4.8 kHz deviation as read on the deviation measuring instrument used. For multiple frequency models adjust the F2, F3, and F4 DEV controls with the frequency selector switch in the corresponding position.

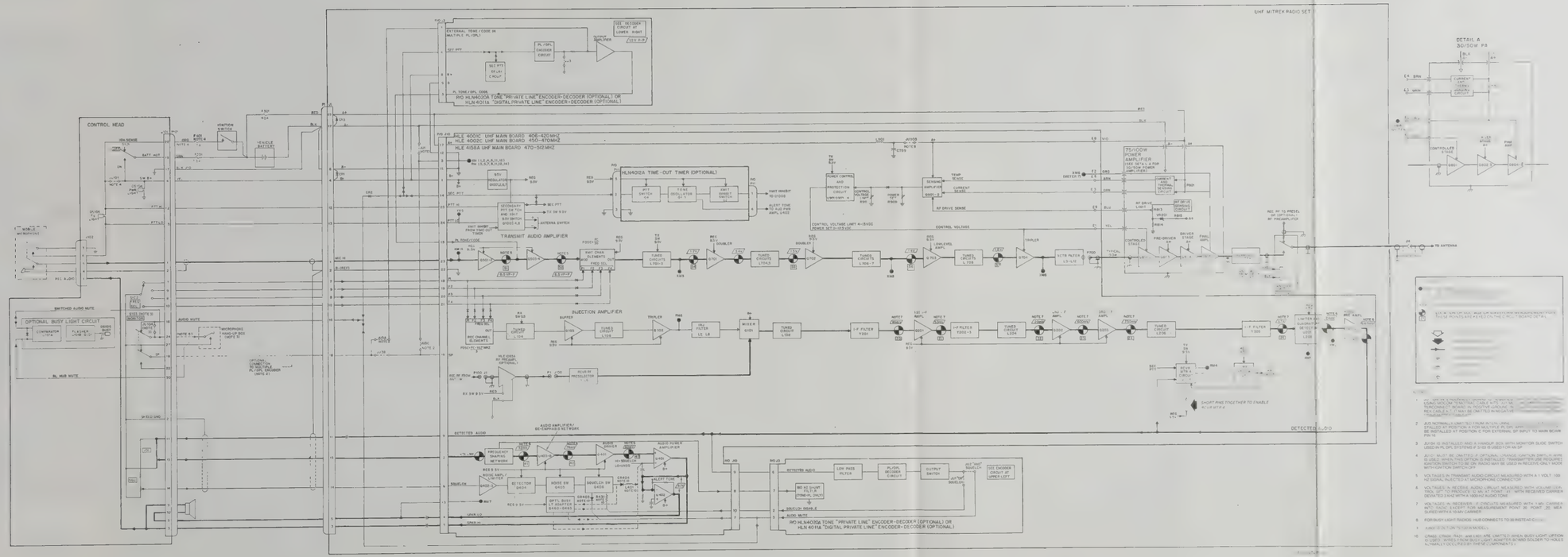
Step 4. "Private-Line" tone deviation should be between 0.5 and 1 kHz.

FINAL METER READINGS

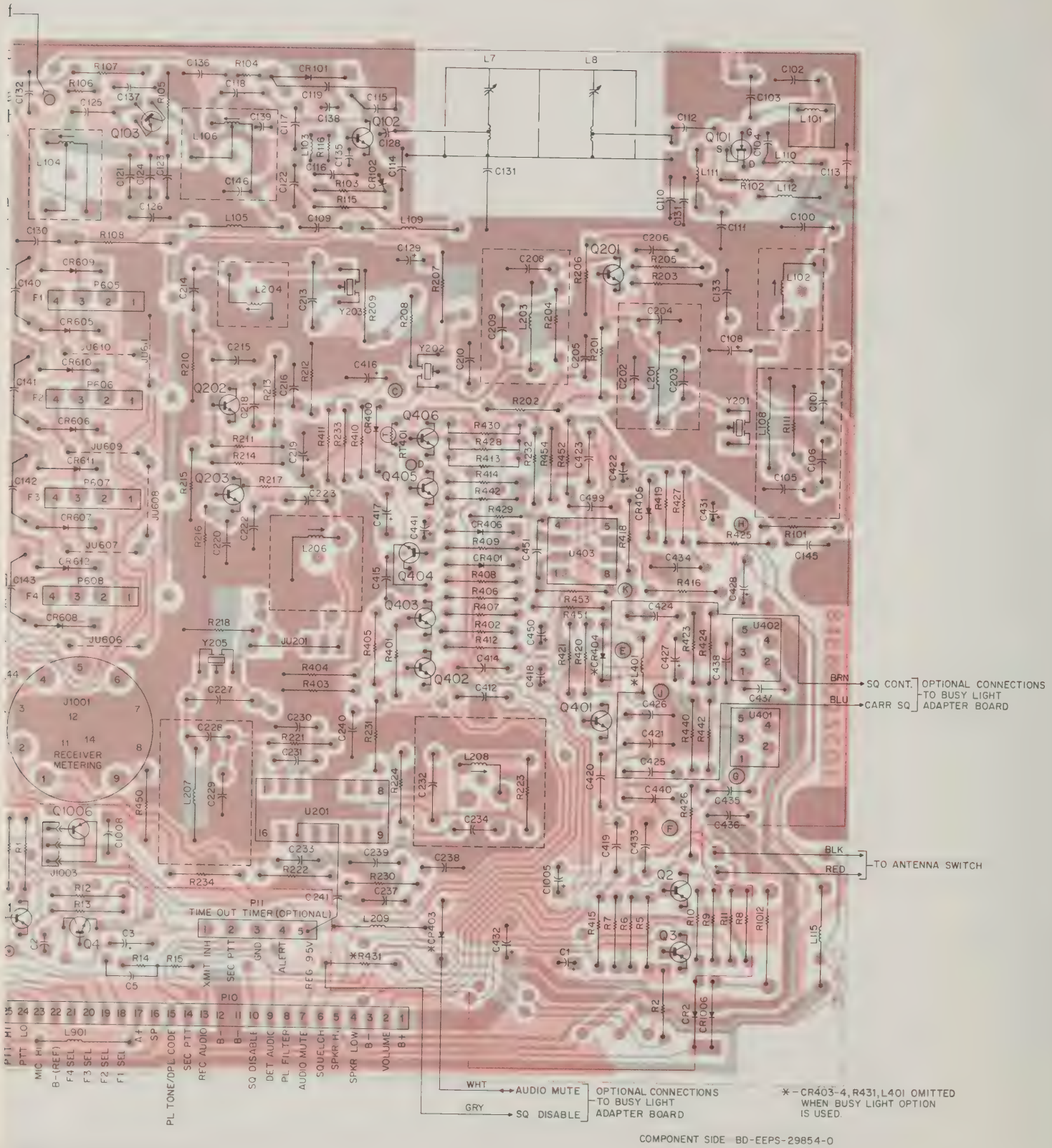
1. Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook
2. The readings at M3 and M5 are purely relative and do not give actual current or voltage measurements
3. Multiply the microampere scale reading obtained at M7 by 0.7 (30 W), 0.8 (50 W), or 1.1 (75/100 W) to determine the actual final amplifier current in amperes.

WHEN THE TRANSMITTER IS PROPERLY ALIGNED, METER DEFLECTIONS SHOULD FALL WITHIN THE LIMITS SHOWN IN TABLE BELOW.

	METER 3	METER 5	METER 6	METER 7
METER READINGS	15 (min) 50 (max)	10 (min) 50 (max)	6 (min) 50 (max)	17 (max) 50 W or 100 W radios) 13 (max) 75 W radios)
FUNCTION METERED	Base of First Doubler	Base of Low Level Ampl	Input of Exciter Filter	Final Ampl Current



FUNCTIONAL BLOCK DIAGRAM/TRANSMITTER ALIGNMENT

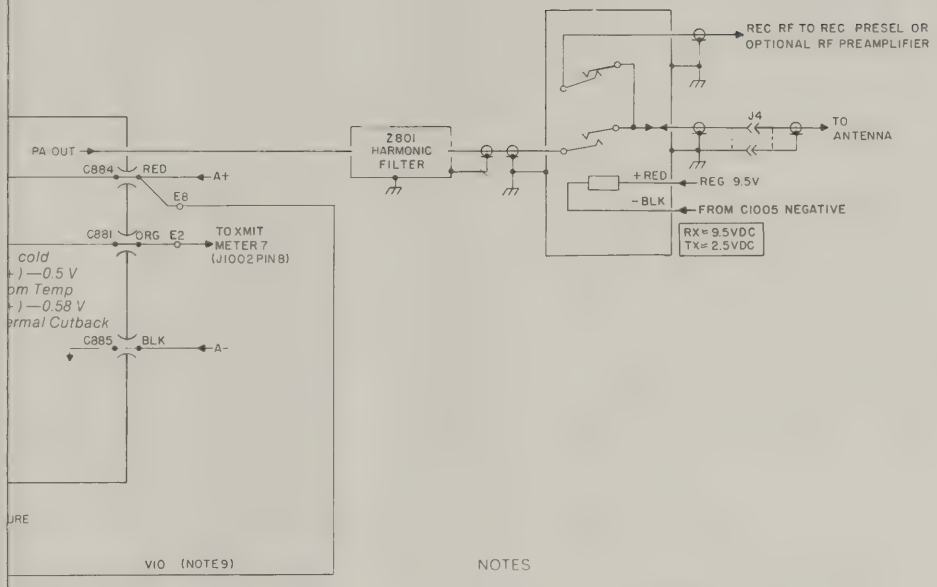


SHOWN FROM SOLDER SIDE

COMPONENT SIDE BD-EEPS-29854-O

SOLDER SIDE BD-EEPS-29855-O

OL-EEPS-27566-C



Q902 senses and maintains a constant current to the power amplifier final stages. RT801 senses PA temperature and causes final amplifier stage current to decrease above a given temperature to maintain the PA in a safe operating condition.

SQUARE PAD ON PC. BOARD INDICATES:
1. GATE OF FET
2. BASE OF TRANSISTOR
3. CATHODE OF DIODE
4. POSITIVE LEAD OF ELECTROLYTIC CAPACTORS

NOTES

1. Unless otherwise indicated
Resistor values are in ohms: Capacitor values are in microfarads
2. Only the protection circuit portion of the power amplifier is shown on this diagram. See the applicable separate power amplifier schematic diagram for the complete circuit
3. Points shown as ① ②, etc. are connected to the interconnect board for distribution to other points in the radio. See receiver schematic diagram for the actual connections
4. C758 is plated on circuit board
5. JU601-JU605 installed as required to bus 2 or more channel select lines to a single channel element when those channels use the same receive frequency
6. Frequency calculation: $f_O = f_C \pm 36$

   Where f_O = crystal frequency and
   f_C = carrier frequency
7. JU905 is out on 75/100W models.
8. Circuitry shown within dashed box is used in 75/100 W radios only
9. Wires supplying A + and rf drive sense used in 75/100 W radios only.
10. Frequency range sensitive part. Indicated value is for 450-512 MHz. See parts list for the 403-420 MHz part values.

UHF "MITREK" RADIO

TRANSMITTER SECTION BOARD DETAIL

Reference Series Key

REFERENCE	CIRCUIT
0-99	Receiver Meter 4, Receiver 9.5 V Switch
100-199	Receiver Injection and Receiver rf
200-299	IF
300-399	—
400-459	Detector, Receiver Audio, Squelch
460-480	Busy Light Adapter
500-599	Transmit Audio
600-699	Transmit and Receive Channel Elements
700-799	Exciter
800-899	Power Amplifier
900-999	Power Control and Protection
1000-1099	Regulator, Transmitter 9.5 V Switch, PTT

68P81039E21-D
(Sheet 1 of 5)
5-9-82 GGI

parts list

LEGEND
L = 406-420 MHz
H = 450-512 MHz

P/O HLE4001C UHF Main Board, Transmitter Section (406-420 MHz)
P/O HLE4002C UHF Main Board, Transmitter Section (450-470 MHz)
P/O HLE4158A UHF Main Board, Transmitter Section (470-512 MHz) PL-6028-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: ±5%; 500 V
C501	21-8399E36	.01 µF - 60, +40% 200 V
C502	21-8399E10	220 pF ±5%
C503,504	8-8491131	.047 µF ± 10% 250 V
C505, 506	21-8399E10	220 pF ±20%
C507	8-8496D03	.01 µF ± 10% 250 V
C508	8-8290G40	.03 µF 50 V
C509	8-83813H44	.0012 µF; 100 V
C511	23-8466F03	100 µF + 100 - 10%, 25 V
C602	21-8448K02	.01 µF +20% 100 V
C701H	21-8406D82	36 pF
C701L	21-8449B84	47 pF ±5% NPO; 500 V
C702H	21-8245B13	1.5 pF
C702L	21-8245D18	2 pF ±.5%; 500 V
C703H	21-8406D86	47 pF
C703L	21-8406D84	56 pF ±5% NPO; 500 V
C704H	21-8245B13	1.5 pF
C704L	21-8245D18	2 pF ±.5% NPO; 500 V
C705H	21-8449B23	120 pF
C705L	21-8379B17	100 pF ± 5% NPO; 200 V
C706H	21-8449B14	68 pF; 200 V
C706L	21-8449B91	100 pF ±5% NPO; 200 V
C707	21-8399E13	.001 µF ± 10%, 1000 V
C708	21-8399E13	.001 µF ± 10%, 1000 V
C709	21-8406D80	4.7 pF ± .25 pF
C710	21-8399E13	.001 µF ± 10%, 1000 V
C711	21-8399E36	.01 µF + 80, - 20%, 200 V
C712H	21-8406D93	16 pF
C712L	21-8406D87	22 pF ± 5% NPO; 500 V
C713H	21-864518	1 pF
C713L	21-8245D08	1.2 pF ± 5%; 100 V
C714H	21-8406D56	24 pF
C714L	21-8406D87	43 pF ± 5% NPO; 500 V
C715H	21-8006TA54	56 pF
C715L	21-8406D87	43 pF ± 5% NPO; 500 V
C716, 717	21-8399E13	.001 µF ± 10%, 1000 V
C718H	21-8406D94	9 pF ± .5 pF
C718L	21-8220H81	13 pF ± 5% NPO; 500 V
C719H	21-8245B48	0.75 pF
C719L	21-8245D97	1 pF ± 5%; 500 V
C720H	21-8006TA29	11 pF ± .5 pF
C720L	21-8406D55	18 pF ± 5% NPO; 500 V
C721H	21-8406D92	36 pF
C721L	21-8449B56	47 pF ± 5% NPO; 500 V
C722	21-8399E13	.001 µF ± 10%, 1000 V
C723	21-8406D62	2 pF
C724	21-8399E13	.001 µF ± 10%, 1000 V
C725	21-8237ZC10	.05 µF ± 20% 25 V
C726H	21-8406D87	43 pF
C726L	21-8406D71	33 pF NPO
C727H	21-8220H81	13 pF
C727L	21-8406D87	43 pF ± 5% NPO; 500 V
C728H	21-8220H74	24 pF
C728L	21-8406D71	33 pF NPO
C729	21-8287T824	220 pF ± 10% 75 V
C730	21-8399E13	.001 µF ± 10%, 1000 V
C731H	21-8406D63	6 pF ± .25 pF
C731L	21-8406D84	6.8 pF ± .25 pF NPO; 500 V
C737, 738	21-8237ZC10	.05 µF ± 20% 25 V
C743	21-8399E13	.001 µF ± 10%, 1000 V
C744H	21-8006TA35	15 pF
C744L	21-8406D55	18 pF ± 5% NPO; 500 V
C747	21-8237ZC09	0.1 µF + 80, - 20% 25 V
C748, 509	23-8453RG14	1 µF + 10%, 35 V
C753	21-82187B48	.003 µF ± 10%, 100 V
C755	21-8406D88	27 pF
C756	23-8466SF01	10 µF, 25 V
C757	21-8399E13	.001 µF ± 10%, 1000 V
C758		plated on circuit board
C759	21-8237ZC10	.05 µF ± 20% 25 V
C760	21-82187B45	470 pF ± 20% 25 V
C902, 907	21-82187B44	.001 µF ± 10%, 100 V
C908	21-82187B48	.003 µF ± 10%, 100 V
C909	21-82187B44	.001 µF ± 10%, 100 V
C910	23-8453RG04	15 µF ± 20% 20 V
C914	21-82187B44	.001 µF ± 10%, 100 V
C916	23-8453RG22	6.8 µF ± 10% 20 V
C917	21-82187B44	.001 µF ± 10%, 100 V
C918, 919	21-8237ZC10	.05 µF ± 20% 25 V
C920	23-8453RG04	15 µF ± 20% 20 V
C921	23-8453RG05	10 µF ± 20% 15 V
C1004	21-8399E37	.01 µF + 70, - 30%, 100 V
C1005	23-8466SF02	15 µF + 100, - 10% 25 V
C1007	21-8237ZC10	.05 µF ± 20% 25 V
C1008	23-8466SF03	100 µF + 100 - 10% 25 V
C1009	21-844163	.0015 µF ± 20% 250 V
C1010	21-8399E21	.01 µF + 80, - 40% 250 V
C1011	23-8466SF03	100 µF ± 20% 35 V

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR601 thru 604	48-8354H01	**diode: (see note)** silicon
CR701	48-8246R13	silicon
CR702	48-8219G01	germanium
CR703	48-8365H01	silicon
CR706	48-8219G01	germanium
CR901, 905	48-8365H01	silicon
CR902, 905, 907, 908 909	48-8246R13	silicon
CR1001	48 8365H02	silicon
CR1002 1003	48-8365H01	silicon
CR1206	48-8246R13	silicon
J501	8-80028A01	**connector, receptacle:** female, 3-contact
J1002	8-80031D02	female, 12-contact
J1003	9-80028A01	female: 3-contact
L701	24-83377G11	**coils:** 6½ turns (Violet)
L702, 703	24-80068A17	6½ turns (Yellow)
L704	24-80068A18	4½ turns (Orange)
L705	24-80068A19	4½ turns (White)
L706	24-80034A02	3½ turns (White)
L707	24-80034A03	3½ turns (Red)
L708H	24-80034A03	3½ turns (Red)
L708L	24-80034A04	3½ turns (Red)
L710	24-82835G13	choke; 0.82 µH
L711	24-83377B02	choke; 2½ turns
L712	24-82835G13	choke; 0.82 µH
L713	24-83681B07	choke; 3½ turns
L714	24-82835G13	choke, 0.82 µH
L715	24-80036A02	choke; ½ turn; ferrite
L716H	10-518	BARE WIRE
L716L	24-82729-25	.033 µH ± 5%
L717H	30-10288C57	22 ga 0.36"
L717L	24-80266B02	coil
L718H	24-84514A04	1½ turns
L718L	24-80068B01	coil, rf
L722, 723	24-82835G13	choke; 0.82 µH
L724, 725	24-80036A02	choke; ½ turn; ferrite
L901	24-80335G03	choke; 33 µH
P601 thru 604	28-80096A02	**connector, plug:** male; 5-contact
Q501	48-869643	**transistor: (see note)** PNP; type M8643
Q502, 503	48-869642	NPN, type M9642
Q504	48-869643	PNP; type M8643
Q701	48-865494	NPN, type M9494
Q702	48-865638	NPN; type M9638
Q703	48-865657	NPN; type M8657
Q704	48-869857	NPN; type M9857
Q901	48-865652	field-effect, type M8652
Q902	48-869643	PNP; type M9643
Q903	48-869642	NPN; type M9642
Q904	48-84111L10	PNP; type M1110
Q1001, 1002	48-869642	NPN; type M9642
Q1003	48-869680	NPN; type M9680
Q1004	48-869643	PNP; type M9643
Q1006	48-84111L10	PNP; type M1110
Q1007	48-869642	NPN, type M9642
Q1008	48-869643	PNP; type M9643
R501	6-11009C43	**resistor, fixed: ± 10%; 1/4W;** unless otherwise stated 560
R502, 503	6-11009C83	27k
R504, 505	6-11009C13	33 ±5%
R506, 507	6-11009C93	68k
R508, 509	6-11009C73	10k
R510	6-11009C69	6.8k ±5%
R511, 512	6-11009C79	7.5k ±5%
R513	6-11009C32	200 ±5%
R514	6-11009C01	10
R515	6-11009C38	360 ±5%
R601	6-11009C65	4.7k
R702	6-11009C92	62k ±5%
R703	6-11009C05	15
R704	6-11009C73	10k
R706H		not used
R706L	6-11009C25	100 ± 10% ¼ W
R707	6-11009C17	47
R708	6-11009C73	10k
R709	6-11009C29	150; ½ W
R710H	6-11009C25	100 ±5%
R710L	6-11009C21	68
R711H		not used
R711L	6-11009C49	1k
R712H		not used
R712L	6-11009C40	430
R713	17-82036G08	10 ±5%; 2 W
R714	6-11009C49	1k ±5%
R717	6-11009C17	47
R718	6-11009C25	100
R719	6-11009C90	51k ±5%
R907	6-11009C81	22k
R908	6-11009C43	560
R909	18-80258B02	variable; 5k

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

note

HLE4105A, HLE4106A, and HLE4107A RF Decks and HLN4184A Antenna Switch are not field repairable, and replacements should be ordered as a unit. Mechanical parts for the rf deck are available (see Sheet 5 of this section)

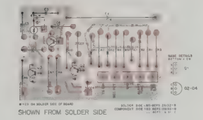
The harmonic filter is not field reparable, and replacements should be ordered by Motorola Kit Number HFE4003A (406-420 MHz) or HFE4001A (450-512 MHz) for low power, or HFE4002A (406-420 MHz) or HFE4003A (450-512 MHz), both high power. For each harmonic filter ordered, order also one factory-formed wire, Motorola Part No 30-80064A01.

HLN4012A Time-Out Timer PL-6032-F

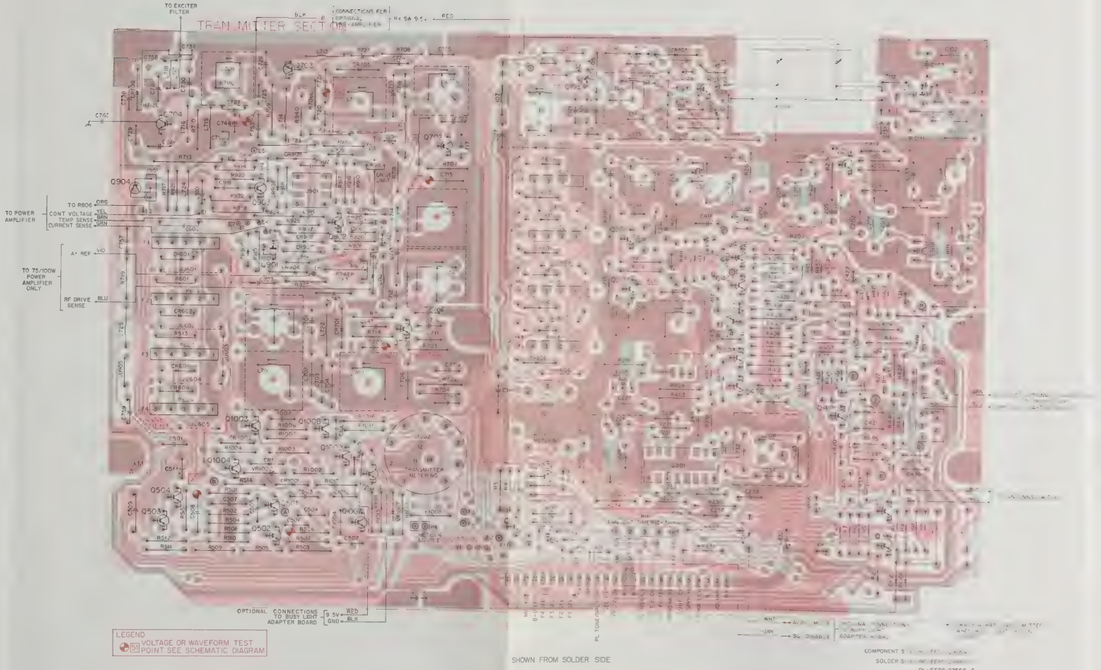
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed
C1	21-8237ZC10	.05 µF + 80, - 20% 25 V
C2	23-8318D01	120 µF + 10% 15 V
C3	8-84637L38	.0033 µF ± 10%, 630 V
C4	23-8453RG01	1 µF - 20%, 35 V
C5	8-84637L32	.0068 µF ± 10%, 630 V
C6, 7	21-8359E10	220 pF ± 5%, 500 V
C8	21-82187B44	.001 µF ± 10%, 100 V
C9	21-83406D81	20 pF ± 5%, 500 V
CR1, 2	48-8365H01	**diode: (see note)** silicon
P11	9-80098A01	**connector, receptacle:** female, 5-contact
Q1	48-869673	**transistor: (see note)** Thyristor, type M9673
Q2	48-869457	PNP; type M9467
Q3, 4	48-869642	NPN, type M8642
R1	6-11009C71	**resistor, fixed: ± 10%, ¼ W;** unless otherwise stated 8.2k
R2	6-11009D11	360k ±5%
R3	6-11009C89	47k ±5%
R4	6-11009C97	100k ±5%
R5	6-11009C53	1.5k ±5%
R6	6-11009C33	220
R7	6-11009C73	10k
R8	6-11009C81	2.2k ±5%
R9	6-11009C77	15k
R10	6-11009C49	1k ±5%

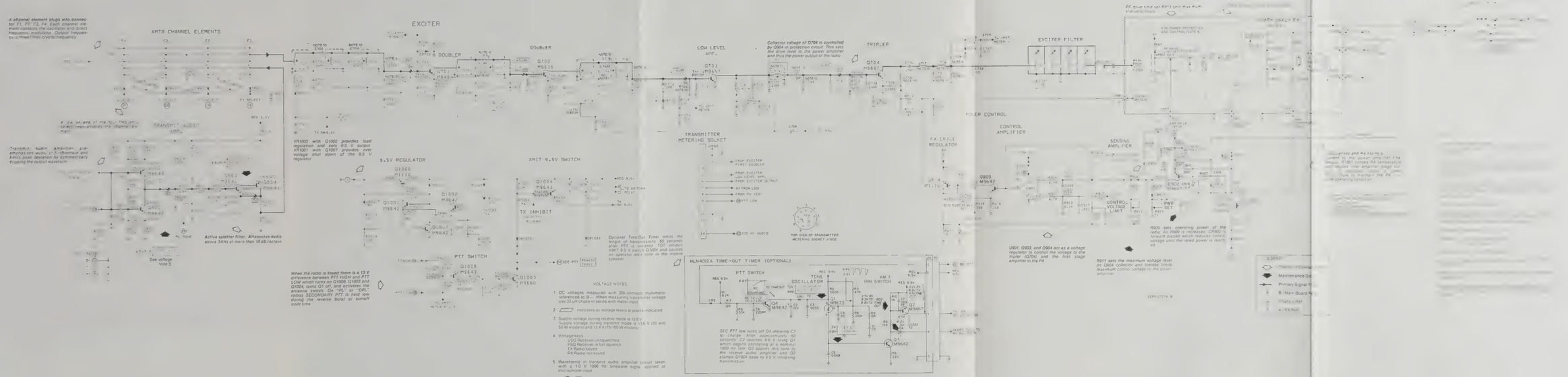
note: For optimum performance, order diodes, transistors, and integrated circuits by Motorola part numbers.

TIME-OUT TIMER

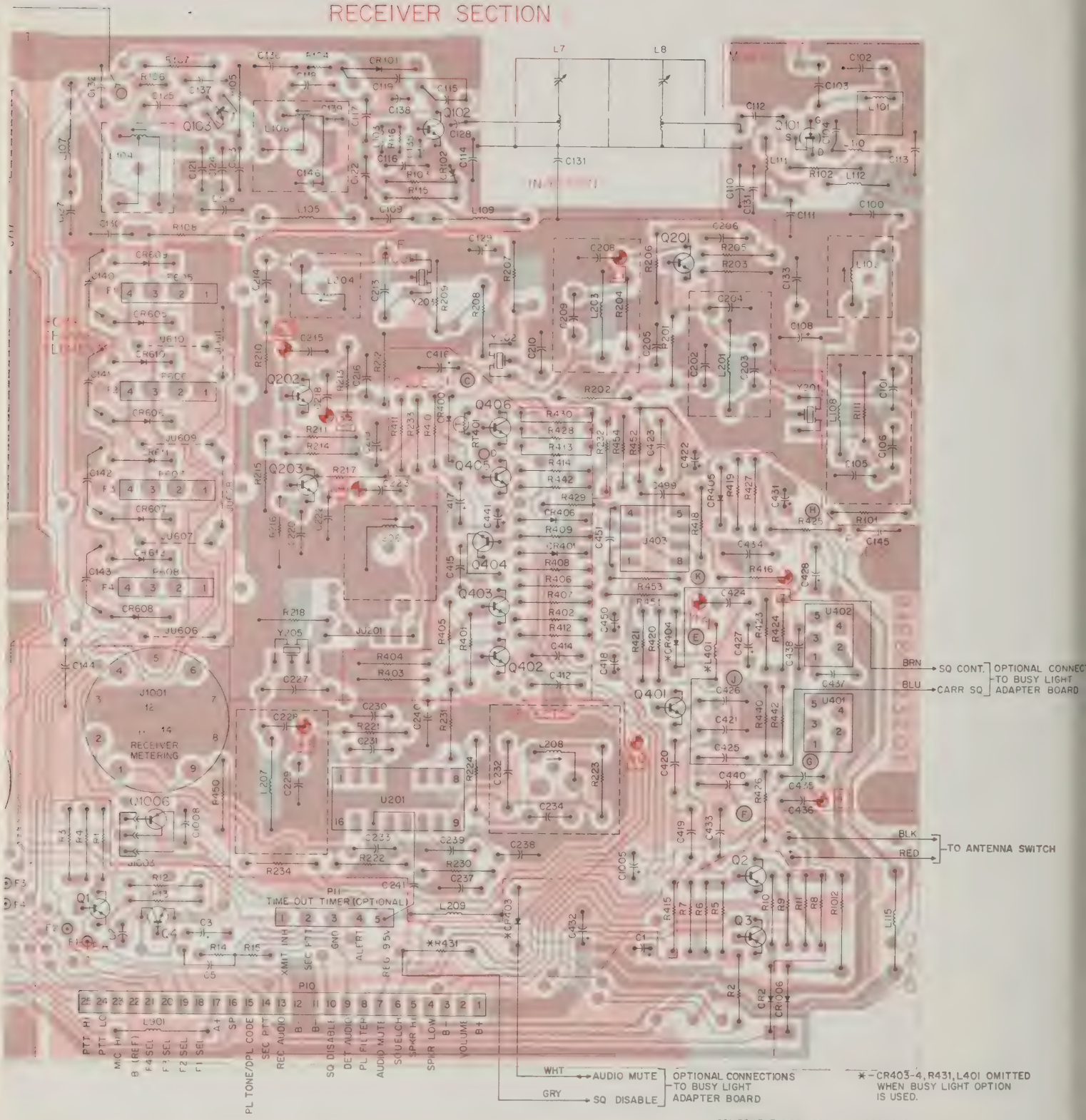


SHOWN FROM SOLDER SIDE




EXCITER
XMTR CHANNEL ELEMENTS
A channel element plugs into connector F1, F2, F3, F4. Each channel element contains the oscillator and direct frequency modulator. Output frequency is three times crystal frequency
A, D4 or D8 is the only component that differs between models
Transmit audio amplifier provides pre-emphasis, audio 3 dB/octave and limits peak deviation by symmetrically clipping the output waveform
Active splatter filter. Attenuates audio above 3KHz at more than 18 dB/octave
See voltage Note 5
9.5V REGULATOR
XMIT 9.5V SWITCH
TX INH-181T
PTT SWITCH
DOUBLER
LOW LEVEL AMPL
TRIPLER
TRANSMITTER METERING SOCKET J1002
PA CABLE REGULATOR
EXCITER FILTER
POWER CONTROL
CONTROL AMPLIFIER
SENSING AMPLIFIER
CONTROL VOLTAGE LIMIT R911
PWR SET R909
Q903 M9642
Q902 CR6
When the radio is keyed there is a 12 V difference between PTT HIGH and PTT LOW which turns on Q1008, Q1003 and Q1004, turns Q1 off, and activates the antenna switch. On models with TGPL, resistor SECONDARY PTT is held low during the reverse burst or turnoff code time
Optional Time-Out Timer limits the length of transmissions 60 seconds after PTT is activated. TOT inhibits XMIT 9.5 V switch Q1004 and sounds an operator alert tone in the mobile speaker
TOP VIEW OF TRANSMITTER METERING SOCKET J1002
HLN4012A TIME-OUT TIMER (OPTIONAL)
PTT SWITCH
TONE OSCILLATOR
XMIT INH SWITCH
SEC PTT low turns off Q4 allowing C7 to charge. After approximately 60 seconds C2 reaches 8.6 V, fixing Q1 which begins oscillating at a nominal 1000 Hz rate. Q3 applies this tone to the receive audio amplifier and Q2 clamps Q1004 base to 9.5 V inhibiting transmission
VOLTAGE NOTES
1 DC voltages measured with 20k ohm/volt multimeter referenced to B—. When measuring transistor voltage use .33 uH choke in series with meter input
2 indicates ac voltage levels at points indicated
3 Supply voltage during receive mode is 13.8 V. Supply voltage during transmit mode is 13.6 V (30 and 50 W models) and 13.4 V (75/100 W models)
4 Voltage keys
USQ Receiver unsquelched
FSQ Receiver in full squelch
TX Radio keyed
RX Radio not keyed
5 Waveforms in transmit audio amplifier circuit taken with a 1.0 V 1000 Hz sinewave signal applied at microphone input
6 indicates points at which AC voltages or waveforms are measured
LEGEND
Primary Signal Flow
B (Main Board Flow)
6SP81039E21-D
(Sheet 2 of 5)
5-9-82 GGI
TRANSMITTER SECTION

RECEIVER SECTION



* - CR403-4, R431, L401 OMITTED WHEN BUSY LIGHT OPTION IS USED.

SHOWN FROM SOLDER SIDE

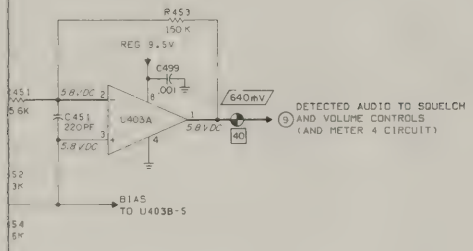
COMPONENT SIDE BD-EEPS-29854-O

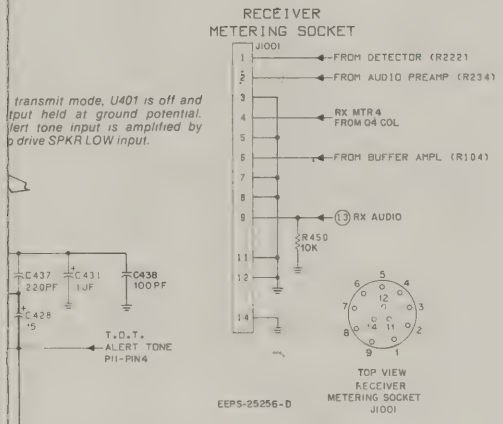
SOLDER SIDE- BD-EEPS-29855-O

OL-EEPS-27566-C

RVOL-EEPS-27568-O

BARD





transmit mode, U401 is off and tput held at ground potential. lert tone input is amplified by o drive SPKR LOW input.

NOTES:

1. **Unless otherwise specified: Resistor values are in ohms. Capacitor values are in microfarads.**
2. **Points shown ①, ②, etc. are connected to interconnect board.**
3. **Frequency calculation:** $F_{osc} = \frac{F_c - 10.7\,MHz}{9}$
4. **Function of interconnect board jumpers is as follows:**
   - **A. JU1 is only necessary when Mitrek radios are used with negative ground MOCOM 70 accessories.**
   - **B. JU3 normally out. Clip may be installed in position A to connect an external PL tone or DPL code in encoder or may be installed at position B to allow an SP input to main board pin 16.**
5. **JU611 installed in single-frequency radios to enable F1 channel elements. JU606–JU610 installed as required to bus 2 or more channel-select lines to a single channel element when those channels use the same receiver frequency.**
6. **Feedthru capacitors C11–C29 on interconnect board are all 470 pF.**
7. **Frequency-range-sensitive part. Indicated value is for the 450–470-MHz radios. See parts list for the 406–420-MHz and 470–512-MHz part values.**
8. **JU460 out for "AND" squelch, in for "OR" squelch. When busy light option is used:**
   JU460 alone determines the type of squelch.
   JU1 on PL board or JU5 on DPL board must be in.
   JU2 on PL board or JU4 on DPL board must be out.
9. **CR403, CR404, R431, and L401 are omitted when busy light option is used and wires from Busy Light Adapter Board solder to holes normally occupied by these components.**
10. **Body of L103 and R116 should be closest to Q102.**

TABLE A. SQUELCH CIRCUIT PARAMETERS

MODELS	CONDITION	AUDIO MUTE (7)	SQUELCH DISABLE (10)	SQUELCH SWITCH EMITTER Q405	MUTE SWITCH COLLECTOR Q406
CARRIER SQUELCH	NO CARRIER	6.8 V	1.2 V	1.2—3.5 V	1.5—5.0 V
	CARRIER PRESENT	6.8 V	0.8 V	0.0 V	0.2 V
PL-DPL MODELS WITH "AND" SQUELCH	NO CARRIER	1.6 V	0.4 V	1.2—3.5 V	1.5—5.0 V
	CARRIER + PL OR DPL	PL 7.6 V DPL 12.3 V	0.8 V	0.0 V	0.2 V
	CARRIER W/O PL OR DPL	1.6 V	0.4 V	1.2—3.5 V	1.5—5.0 V
PL-DPL MODELS WITH "OR" SQUELCH	NO CARRIER	1.6 V	0.4 V	1.2—3.5 V	1.5—5.0 V
	CARRIER + PL OR DPL	1.6 V	13.6 V	0.0 V	0.2 V
	CARRIER W/O PL OR DPL	1.6 V	0.4 V	1.2-3.5 V	1.5—5.0 V
ALL MODELS	RADIO KEYED	1.1 V	0.3 V	6.0 V	3.5 V
MODELS WITH BUSY LIGHT ADAPTER HLN4119A	NO CARRIER	TABLE B	TABLE B	1.2-3.5 V	4.5 V
	CARRIER	TABLE B	TABLE B	0.0 V	0.2 V

TABLE B. BUSY LIGHT CIRCUIT PARAMETERS

CONDITION		SQUELCH DISABLE (10)	Q463 COLLECTOR	Q462 COLLECTOR	AUDIO MUTE (7)
CARRIER SQUELCH	NO CARRIER	0 V	1.4—2 V**	9.4 V	1.4-2.0 V
	CARRIER	0 V	5.9—8.8 V**	9.4 V	5.9-8.8 V
PL/DPL AND/OR) SQUELCH*	NO CARRIER	0 V	1.4—2 V**	9.4 V	1.4-2.0 V
	CARRIER	0 V	5.9—8.8 V**	9.4 V	5.9-8.8 V
	CARRIER + PL	13.6 V	9.4 V	0.1 V	9.4 V

* See Note 9 for proper installation of PL/DPL jumpers when Busy Light Adapter HLN4119A is used

** Voltage depends on whether or not JU460 is in or out, and if mic is on or off hook

UHF "MITREK" RADIO

RECEIVER SECTION BOARD DETAIL

parts list

HLN4044A Interconnect Board PL-6030-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C1, 2	23-83210A19	500 µF – +100, – 10%, 20 V
C3	23-84665F01	10 µF ± 20% V
C11 thru 29	21-84874K01	470 pF ± 20%, 25 V (lead-thru)
		diode (see note)
CR1	48-82525G19	silicon
CR2	48-83634H01	silicon
CR3	1-80701T74	silicon
CR4	48-82456H18	silicon
		connector, receptacle
J1	1-80761T74	CONNECTOR, assembly, includes C11-C29
J3	9-80180B02	female, 9-contact
J10	9-80180E03	female, 25-contact
		resistor, fixed:
R2	6-11009C65	1.8k ± 10%, ½ W
R4	6-11009C33	220 ± 10%, ½ W
		mechanical parts
	42-80088A01	CLIP, option

Note: Electrolytic performance index (index numbers) and negated circuit no. Motorola part numbers

HLN4119A Busy-Light Adapter PL-6323-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C460	23-84665F01	10 µF
1,450		**choke** 0.41 µH
CR460-462	48-83634H02	silicon
		diode (see note)
R460	6-11009C67	5.6k
R461	6-11009C56	2k
R462	6-11009C49	1k
R463	6-11009C61	3.3k
R463	6-11009C65	2.2k
R464	6-11009C66	4.7k
R465	6-11009C49	1k
R466	6-11009C71	8.2k
R467	6-11009C66	5.1k
R468	6-11009C49	1k
R469	6-11009C65	4.7k
R470	6-11009C66	5.1k
R471	6-11009C25	100k
		transistor: (see note)
Q450	48-869642	NPN, type M9642
Q451	48-869643	PNP, type M9643
Q453	48-869642	NPN, type M9642
Q454	48-869643	PNP, type M9643

LEGEND

L - 406-450 MHz
M - 450-470 MHz
H - 470-512 MHz

P/O HLE4001C UHF Main Board: Receiver Section (406-420 MHz)
P/O HLE4002C UHF Main Board: Receiver Section (450-470 MHz)
P/O HLE4158A UHF Main Board: Receiver Section (470-512 MHz) PL-6035-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: ±5%; 500 V unless otherwise stated
C1	23-84665F04	1µF – 50, – 10%, 50 V
C2	23-84665F01	10 µF – 100, – 10%, 25 V
C3	23-84538G04	15 µF ± 20% 20 V
C5	21-82275C10	05 µF ± 5%, 25 V
C100	21-80067A27	10 pF

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C101	21-82610C09	120 pF ± 5%, 200 V
C102L	21-83406C82	36 pF
C102M, H	21-82275C10	05 µF ± 5%, 25 V
C103L	21-80067A40	20 pF
C103M, H	21-82204B03	6 pF
C104	21-82877B23	10 pF
C105	21-84433B34	17 pF
C106	21-82204B40	3.6 pF
C108	23-84538G02	4.7 µF – 20%, 20 V
C109	21-82187B44	001 µF, 100 V
C110	21-82272C10	05 µF ± 20%, 25 V
C111L, M	21-82187B44	001 µF
C111H	21-82272C10	05 µF ± 20%, 25 V
C112L	21-80067A40	20 pF
C112M, H	21-82204B03	6 pF
C113	21-82272C10	05 µF ± 20%, 25 V
C114	21-82272C10	05 µF ± 20%, 25 V
C115L	21-83406D51	3.0 pF
C115M	21-83406C66	2.7 pF
C115H	21-83406C52	2.0 pF
C116L	21-83406D88	10 pF
C116M	21-83406D70	8 pF
C116H	21-82204B03	6 pF
C117L, M	21-83406D65	5 pF
C117H	21-83406D62	4 pF
C118L	21-82204B03	6 pF
C118M, H	21-83406C54	4.0 pF
C119L	21-84520B20	68 pF
C119M	21-82450B33	56 pF
C119H	21-82450B37	47 pF
C121L	21-82204B75	8.5 pF
C121M, H	21-82610C26	8 pF
C122	21-82187B44	001 µF, 100 V
C123	21-82877B24	022 pF ± 20%; 500 V
C124L	21-82204B41	13 pF
C124M, H	21-83406D84	8.8 pF ± 25 pF
C125L	21-83406D76	3.9 pF
C125M, H	21-83406D52	2 pF – 25 pF
C126, 127	21-83596E36	01 µF – 60, – 20%
C128L, H	21-05311E20	6 pF
C128M	21-84713A46	7 pF
C129	23-84538G02	4.7 µF ± 20%, 20 V
C130	21-84493B41	100 pF ± 10%, 200 V
C131	21-82272C10	05 µF ± 20%, 25 V
C132	21-82187B44	001 µF ± 10%, 100
C133	21-82272C10	05 µF ± 20%, 35 V
C135L	21-84713A29	20 pF
C135M, H	21-82877B17	5 pF
C136, 137	21-83596E10	220 pF
C138	21-82877B51	50 pF
C139L, M	21-82877B17	5 pF
C139H	21-05311E66	3.9 pF
C140 thru 143	21-84448K02	01 µF
C145	21-84493B41	100 pF ± 10%, 200 V
C146	21-82877B18	30 pF
C202	21-82272C10	05 µF ± 20%, 25 V
C203	21-84538G02	4.7 µF ± 20%, 20 V
C204	21-83406C66	27 pF ± 5%
C205, 206	21-82272C10	05 µF ± 20%, 25 V
C208	21-83406D68	27 pF ± 5%
C209	21-83406D56	24 pF ± 5%
C210	21-83406D69	30 pF ± 5%
C213	21-82450B07	39 pF ± 5%
C214	21-82610C27	01 pF
C215	21-80171A51	80 pF, 200 V
C216	21-82272C10	05 µF ± 5%, 25 V
C218	21-82187B44	001 µF, 100 V
C219	23-84538G02	4.7 µF ± 20%, 20 V
C220	21-82272C10	05 µF ± 20%, 25 V
C222	21-84493B33	100 pF
C223	21-84715F26	56 pF
C227	21-82450B04	0.3 pF
C228	21-82610C02	43 pF
C229	21-83406D93	18 pF
C230	21-82272C10	05 µF ± 20%, 25 V
C231	21-83596E36	01 µF – 60, – 40% 150 V
C232	21-82450B45	0.62 pF ± 5%
C233	21-83596E38	0047 µF, 100 V
C234	21-80188A55	07 pF ± 5%, 200 V
C237	21-83596E38	0047 µF, 100 V
C238	21-82272C10	05 µF ± 20%, 25 V
C239	8-84637L02	033 µF ± 5%, 250 V
C240	8-84637L30	0022 µF, 630 V
C241	21-82272C10	05 µF ± 20%, 25 V
C412	8-84637L37	0.1µF ± 10%, 100 V
C414	21-84637L31	047 µF ± 10%, 630 V
C415	21-84494B15	300 pF
C416	21-84538G04	15 µF ± 20%, 20 V
C417	23-84538G02	4.7 µF ± 20%, 20 V
C418	23-84665F01	10 µF – 100, – 10%, 25 V
C419	8-84637L28	018 µF, 250 V
C420	8-84637L27	022 µF, 250 V
C421	8-84637L02	033 µF ± 5%, 250 V
C422	23-84665F01	10 µF – 100, – 10%, 25 V
C423	8-84637L32	0068 µF, 630 V
C424	8-84637L24	047 µF, 100 V
C425	8-84637L25	01 µF, 400 V
C426	8-84637L26	0047 µF, 630 V
C427, 428	23-84538G04	15 µF ± 20%, 20 V

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C431	23-84665F04	1 µF – 150, – 10%, 50 V
C432	21-84667K06	200 µF + 150, – 10%, 25 V
C433, 434	21-84667L33	0.1 µF, 100 V
C435, 436, 437	21-83596E10	220 pF ± 20%
C438	21-80067A65	100 pF
C440	8-84637L27	022 µF, 250 V
C441, 450	23-84665F01	10 µF – 100, – 10%, 25 V
C451	21-83596E10	220 pF ± 20%, 500 V
C499	21-82187B44	001 ± 10%, 100 V
		diode (see note)
CR1, 2	48-83634H01	silicon
CR101	48-82139G01	silicon
CR102	48-83634H01	silicon
CR400	48-83634H01	silicon
CR401	48-83634H01	silicon
CR403 thru 406	48-83634H01	silicon
CR505 thru 512	48-83634H01	silicon
J1001	9-80031C02	**connector, receptacle:** female, 12-contact
L10	76-83960B06	**coil:** ½ turn (ferrite)
L101L	24-80149C02	variable, 1¼ turn
L101M	24-80149C02	variable, ¼ turn
L101H		22 ga. wire
L102	24-84419D01	17½ turns coded white
L103	24-82729H25	choke, .029 µH
L104	24-80065A01	4½ turns
L105	24-82549D42	choke, 10 µH
L106	24-80065A05	4½ turns
L107	24-82549D42	choke, 10 µH
L108	24-82549D42	choke, 10 µH
L109	24-82835G25	choke, 1.5 µH
L110	24-84003B42	ferrite bead
L111	24-82729H29	29 µH
L112		22 ga. wire
L115	23-82598D42	10 µH
L201	24-82549D51	choke, 10 µH
L203	24-82549D52	choke 12 µH
L204	24-84419D03	33½ turns coded GRN
L206	24-84419D03	33½ turns coded GRN
L207	24-82549D52	choke, 12 µH
L208	24-80133A01	26½ turns
L209	24-82835G26	choke, 9.3 µH
L491	24-82729H09	choke, 0.41 µH
P4	28-80181B04	male 2-contact
P10	28-80181B03	male 25-contact
P11	28-80097A01	male, 5-contact
P605 thru 608	28-80098A01	male, 4-contact
Q1 thru 3	48-869643	**transistor: (see note)** PNP, type M9643
Q4	48-869642	NPN, type M9642
Q101	48-869819	field-effect type M9839
Q102	48-84411U09	NPN type M1103
Q103	48-869637	NPN, type M3932
Q201 thru 203	48-864494	NPN, type M9494
Q401 thru 403	48-869642	NPN, type M9642
Q401	48-134674	NPN, type M54
Q405	48-869642	NPN, type M9642
Q406	48-869528	NPN, type M9528
R1	6-11009C59	**resistor, fixed: ± 5%; ½ W;** unless otherwise stated 2.7k
R2	6-11009C15	56k
R3	6-11009C53	1.5k
R4	6-11009C55	4.7k
R5	6-11009C77	15k
R6	6-11009C81	22k
R7	6-11009C15	39
R8	6-11009C73	10k
R9	6-11009C77	15k
R10	6-11009C83	27k
R11	6-11009C41	470
R12	6-11009C77	15k
R13	6-11009C93	68k
R14, 15	6-11009C58	2.4k
R101	6-11009C29	100
R102	6-11009C43	560
R103	6-11009C65	4.7k
R104	6-11009C77	15k
R105	6-11009C24	91
R106	6-11009C45	680
R107	6-11009C57	2.2k
R108	6-125A19	56
R111	6-11003C81	22k, ½ W
R115	6-11009C97	100k
R116	6-11009C73	10k
R117	6-125A33	220 ± 5% W
R201	6-11009C49	1k
R202	6-11009C79	18k
R203	6-11009CA87	39k
R204	6-11009C37	330

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R205	6-11009C09	22
R206	6-11009CA59	2.7k
R207	6-11009C88	43k
R208	6-11009C45	680
R209	6-11009C88	43k
R210	6-11009C89	6.8k
R211	6-11009C83	27k
R212	6-11009C47	820
R213	6-11009C61	3.3k
R214	6-11009C83	27k
R215	6-11009C69	68k
R216	6-11009C47	820
R217	6-11009C61	3.3k
R218	6-11009C79	18k
R221	6-11009C56	2k
R222	6-11009C85	82k
R223	6-11009C63	2.7k
R224	6-11009C65	4.7k
R233	6-11009C47	1k
R231	6-11009C70	7.5k
R232	6-11009C21	68
R233	6-11009C13	33
R234	6-11009C06	220k
R401	6-11009C94	75k
R402	6-11009C89	6.8k
R403	6-11009C45	680
R404	6-11009C84	120k
R405	6-11009C81	22k
R406	6-11009C73	10k
R407	6-11009C49	1k
R408	6-11009C57	2.2k
R409	6-11009C89	47k
R410	6-11009C57	2.2k
R411	6-11009C73	10k
R412	6-11009C72	9.1k
R413	6-11009C79	18k
R414	6-11009C29	150
R415	6-11009C73	10k
R416	6-11009C71	8.2k
R418	6-11009C97	100k
R419	6-11009C73	10k
R420, 421	6-11009C67	5.6k
R422	6-1109C42	510
R423	6-11009C09	22
R424	6-1109C09	22
R425	6-11009C49	1k
R426, 427	6-124D05	2.7 ± 10%
R428	6-11009C82	24k
R429	6-11009C68	6.2k
R430	6-11009C71	8.2k
R431	6-11009C65	33k
R440	6-11009C49	1k
R442	6-11009C33	68k
R450	6-11009C73	10k
R451	6-11009C67	5.6k
R452	6-11009C61	3.3k
R453	6-11009C02	150k
R454	6-11009C57	5.6k
RT401	6-83600K08	**thermistor** 20k ± 10%, @ 25°C
U201	51-84300A78	**integrated circuit: (see note)** type M2078
U401, 402	51-80365C04	type 5504
U403	51-84631K76	type M2176
Y201	48-84396K05	**crystal:** coupled resonator; 10.7 MHz
Y202	48-84396K01	coupled resonator; 10.7 MHz
Y203	48-84396K02	coupled resonator; 10.7 MHz
Y205	48-84396K01	coupled resonator; 10.7 MHz

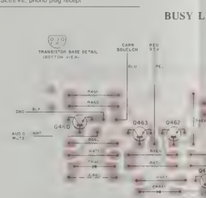
non-referenced items

	5-80029C01	GROMMET, for L208
	26-80263C01	SHIELD, mixer
	26-80270A01	CAN, coil, for L102
	26-80186A01	CAN, coil, for L104
	26-80186A01	CAN, coil, for L106
	26-80121A01	CAN, shield, for L108
	26-80121A01	CAN, shield, for L201
	26-80121A01	CAN, shield, for L203
	26-80270A01	CAN, coil, for L204, L206
	26-80121A01	CAN, shield, for L207
	26-80203A01	CAN, coil, for L208
	75-05295B01	INSULATOR, crystal (4 used)
	26-80216A01	SHIELD, IF
	26-80186D21	SHIELD, detector

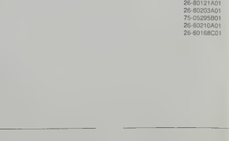
HLE1085A RF Preamplifier (406-512 MHz) PL-6889-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: - 10%; 500 V unless otherwise stated
C1	21-82877B18	30 pF ± 5%
C2	21-82877B17	5 pF ± 5%
C4	21-83068E01	02 µF, 12 V
C5	21-82877B18	30 pF ± 5%
C6	21-83068E01	02 µF, 12 V
C7	21-8616D3	3.3 pF ± 0.25 pF
C8	21-8612I9	1000 pF
C9	21-8612I9	1000 pF
CR1	48-84616A01	**diode, (see note)** hot carrier
L1	24-82723H25	**choke** 33 nH
L2	24-82723H04	0 29 µH
L3	24-82723H04	0 29 µH
L4	24-82723H04	1%
Q1	48-C08698-I0	**transistor, (see note)** NPN type M9870
R1	6-185A53	**resistor, fixed: ± 10%, ½ W;** unless otherwise stated 1.5k ± 5%
R2	6-185B16	1kΩ
R3	6-18A21	68 ± 5%
R4	6-185B7	100
R5	6-185A21	68 ± 5%
J1	9-83563C01	**connector, receptacle** RECEPTACLE, female phono
P1	28 82331G01	**connector, plug:** PLUG, male phono
		mechanical parts
	3-10943D11	SCREW, tapping metric (B3.5 x 1.27 x 13) 2 used
	3-10936B15	SCREW, tapping metric (TT2.5 x .45 x 6) 3 used
	4-83755H01	WASHER, solder 2 used
	15-80733B01	HOUSING, preamplifier
	64-80271B01	PLATE, housing
	29-84706E02	LUG, crimp, 2 used
	9-84041D01	CASING, cable
	26 80234D01	SHIELD
	43 83742C01	SLEEVE, phono plug recept

BUSY LIGHT ADAPTER



SHOWN FROM SOLDER SIDE



SHOWN FROM SOLDER SIDE

SHOWN FROM SOLDER SIDE

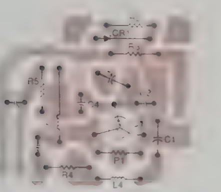
RECEIVER SECTION

INTERCONNECT BOARD

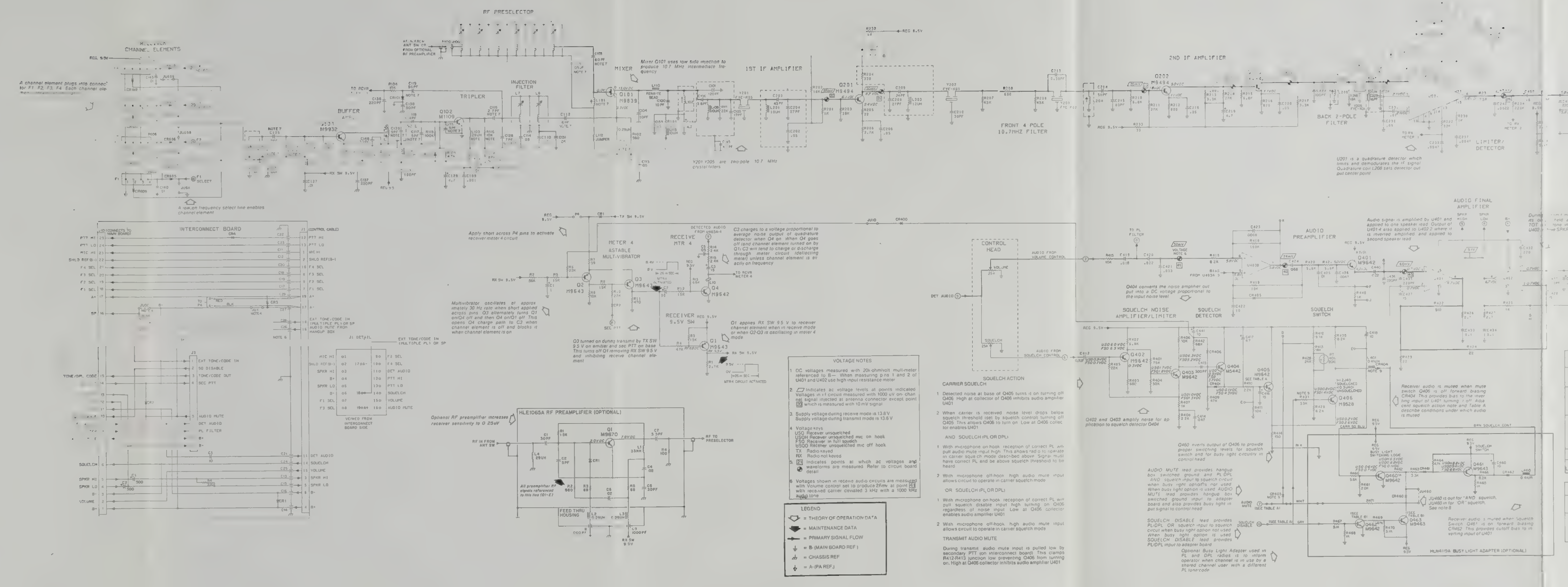
UHF "MITREK" RADIO

RECEIVER SECTION

RF AMPLIFIER



COMPONENT SIDE ⊕ BD BEPW - 0034 - 0
SOLDER SIDE BD BEPW - 0035 - 0
OL BEPW - 0036 - 0



NOTES

1. Unless otherwise specified
   Resistor values are in ohms
   Capacitor values are in microfarads
2. Points shown ①, ②, etc. are connected to interconnect board
3. Frequency calculation $F_{osc} = \frac{F_c - 10.7 MHz}{3}$
4. Function of interconnect board jumpers is as follows
   - A. JU1 is only necessary when Mitrek radios are used with negative ground MOCOM 70 accessories
   - B. JU3 normally out. Clip may be installed in position A to connect an external PL tone or DPL code in encoder or may be installed at position B to allow an SP input to main board pin 16
5. JU611 installed in single-frequency radios to enable F1 channel elements. JU606–JU610 installed as required to bus 2 or more channel-select lines to a single channel element when those channels use the same receiver frequency
6. Feedthru capacitors C11–C29 on interconnect board are all 470 pF
7. Frequency-range-sensitive part. Indicated value is for the 450–470-MHz radios. See parts list for the 406–420-MHz and 470–512-MHz part values
8. JU460 out for "AND" squelch, in for "OR" squelch. When busy light option is used
   JU460 alone determines the type of squelch
   JU1 on PL board or JU5 on DPL board must be in
   JU2 on PL board or JU4 on DPL board must be out
9. CR403, CR404, R431, and L401 are omitted when busy light option is used and wires from Busy Light Adapter Board solder to holes normally occupied by these components.
10. Body of L103 and R116 should be closest to Q102.

TABLE A SQUELCH CIRCUIT PARAMETER

MODELS	CONDITION	AUDIO MUTE ⑦	SQUELCH DISABLE ⑩	SQUELCH SWITCH EMITTER Q405	MUTE SWITCH COLLECTOR Q406
CARRIER SQUELCH	NO CARRIER	6.8 V	1.2 V	1.2–3.5 V	1.5–5.0 V
	CARRIER PRESENT	6.8 V	0.8 V	0.0 V	[illegible]
PL DPL MODELS WITH AND SQUELCH	NO CARRIER	1.6 V	0.4 V	1.2–3.5 V	1.5
	CARRIER + PL OR DPL	PL 7.6 V DPL 12.3 V	0.8 V	0.0 V	0.2 V
	CARRIER W/O PL OR DPL	1.6 V	0.4 V	1.2–3.5 V	1.5–5.0 V
PL DPL MODELS WITH "OR" SQUELCH	NO CARRIER	1.6 V	0.4 V	1.2–3.5 V	1.5–5.0 V
	CARRIER + PL OR DPL	1.6 V	13.6 V	0.0 V	0.2 V
	CARRIER W/O PL OR DPL	1.6 V	0.4 V	1.2–3.5 V	1.5–5.0 V
ALL MODELS	RADIO KEYED	1.1 V	0.3 V	6.0 V	3.5 V
MODELS WITH BUSY LIGHT ADAPTER HLN4119A	NO CARRIER	TABLE B	TABLE B	1.2–3.5 V	4.5 V
	CARRIER	TABLE B	TABLE B	0.0 V	0.2 V

TABLE B BUSY LIGHT CIRCUIT PARAMETERS

CONDITION		SQUELCH DISABLE ⑩	Q463 COLLECTOR	Q462 COLLECTOR	
CARRIER SQUELCH	NO CARRIER	0 V	1.4–2 V	9.4 V	
	CARRIER	0 V	5.9–8.6 V	9.4 V	
PL/DPL AND/OR SQUELCH*	NO CARRIER	0 V	1.4–2 V	9.4 V	
	CARRIER	0 V	5.9–8.8 V	9.4 V	
	CARRIER + PL	13.6 V	9.4 V	0.1 V	9.4 V

* See Note 9 for proper installation of PL DPL jumpers when Busy Light Adapter HLN4119A is used

** Voltage depends on whether or not JU460 is in or out and if mic is on or off hook

RECEIVER SECTION/MECHANICAL PARTS

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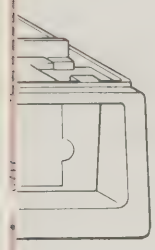


PRING CLIP

LOCK BARREL

PORT
ANT

GBEPS–27667–O

"MITREK" POWER AMPLIFIER

UHF 50 WATTS
MODELS HLE1011C (406-420 MHz)
HLE1012C (450-512 MHz)

ay be removed from the top of the board

erwise specified:
lues are in ohms.
alues are in picofarads.

es microstrip transmission line. Number tands for characteristic impedance ZO.

C831, C833-8, C840, C842 are connected rcuit board ground and chassis ground.

plated on board.

ru capacitors C881-6 and one harmonic filter below the circuit board and must be access- bottom of the radio.

range sensitive part. Indicated value is for ee parts list for 403-420 MHz part values.

dering to or near the crimped metal (used in the harmonic filter, and PA board) be used to ensure that solder flux does not e dielectric; if contact occurs, the capacitor placed.

be removed from the transistor support thout removing the bracket from the PA

END:

= PRIMARY SIGNAL FLOW

= CHASSIS REF.

= A— (PA REF.)

FUNCTION

Increases power output of radio to 50 watts. Contains circuitry to sense temperature and current of final amplifier for application to power control and protection circuit in radio.

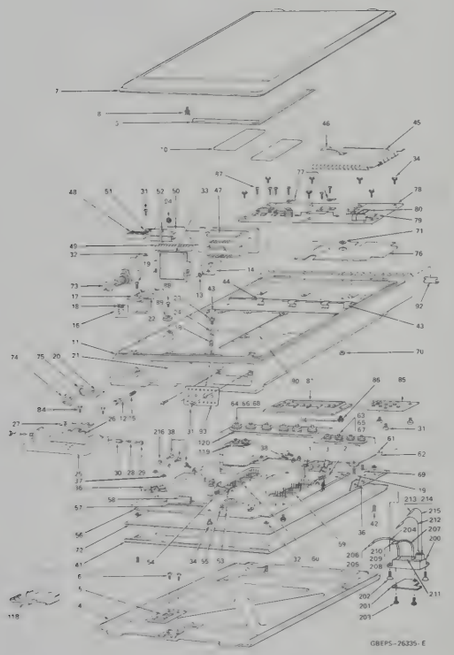
50 WATT POWER AMPLIFIER/30WATT POWER AMPLIFIER

68P81039E27-E
5-9-82 GGI

UHF "MITREK" RADIO

MECHANICAL PARTS

30 AND 50 WATT RADIOS



68P81039E21-D
(Sheet 5 of 5)
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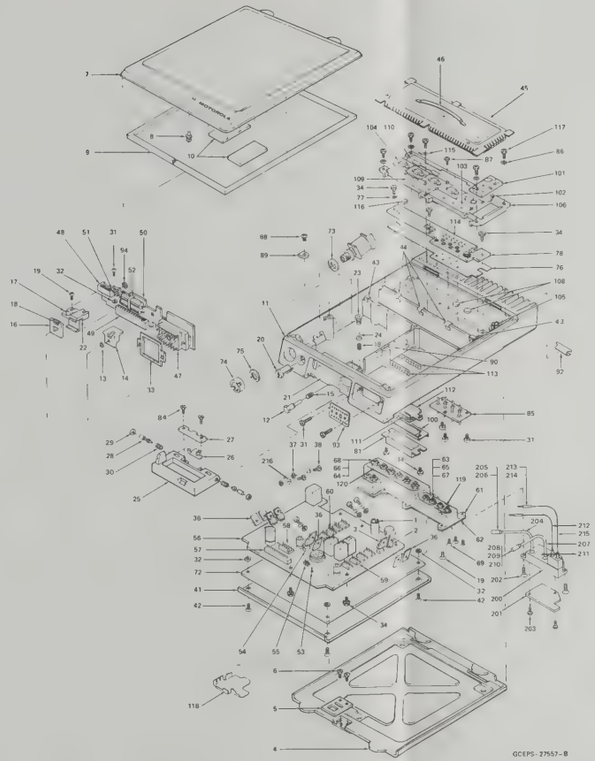
parts list

Mechanical Parts List for UHF Radio PL-6052-E

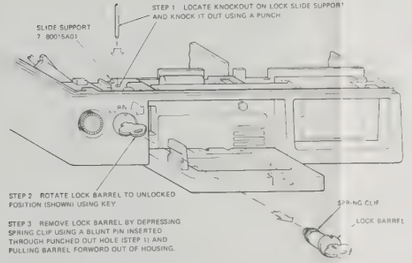
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	26-80150B01	HEATSINK
2	21-80093A01	HEATSINK, transistor
3	—	Q904, Q1606, SEE ELECTRICAL PARTS LIST
4	15-84677L01	COVER, bottom
5	64-80017A01	PLATE, latch
6	3-10936A05	SCREW, machine (M3.5 x 0.6 x 6); 4 used
7	15-84678L01	COVER, top (30/50W models)
	or 15-80136A01	COVER, top (75/100W models)
8	46-80026A01	STUD, latch
9	32-80075A01	GASKET, top cover (30/50W models)
	or 32-80276A01	GASKET, top cover (75/100W models)
10	75-80178A01	PAD, compression (30/50W models), 2 used
	or 75-80243B01	PAD, compression (75-100W models), 2 used
11	15-84676L01	HOUSING (30/50W models)
	or 15-80135A04	HOUSING (75-100W models)
12	47-80027A01	PUSHBUTTON
13	32-80295C01	GASKET, pushbutton
14	7-80030A01	BRACKET, latch
15	41-80029A01	SPRING, latch
16	7-80016A01	BRACKET, lock slide
17	7-80015A01	SUPPORT, lock slide
18	41-80022A01	SPRING, lock, 2 used
19	3-10936B15	SCREW, tapping (B3.5 x 1.27 x 13); 8 used
20	55-80370A01	LOCK
21	13-80063A01	ESCUTCHEON
22	32-80081L02	GASKET, lock support
23	43-80150A01	SLEEVE, cover release
24	46-80151A01	STUD, cover release
25	55-80002A01	HANDLE
26	7-80113B01	BRACKET, latch
27	64-80019A01	PLATE, backup
28	47-80021A01	PIN, pivot, 2 used
29	4-80125A01	WASHER, pivot; 2 used
30	41-80175A01	SPRING (3.05 MM O.D.), 2 used
31	3-10904A02	SCREW, machine (M3 5 x 0.6 x 6); 6 used
32	4-80149A01	WASHER, captivative; 5 used
33	32-80074A02	GASKET, cable plug
34	3-10922A06	SCREW, tapping (B3.5 x 1.27 x 8); 14 used on 30/50W models, 10 used on 75-100W models
36	14-83820M02	INSULATOR, sil, 5 used
37	4-84180C01	WASHER, shoulder, 5 used
38	3-10905A01	SCREW, machine (M3 x 0.5 x 6), 5 used
41	15-80004A01	COVER, bottom inner
42	3-10906A19	SCREW, machine (M3.5 x 0.6 x 13), 4 used
43	42-80013A01	CLIP, coax (dress), 2 used
44	42-80359A01	CLIP, coax; 3 used
45	26-80211A01	SHIELD, PA (30/50W models)
	or 26-80561C01	SHIELD, PA (100/75W models)
46	55-84300B04	HANDLE, nylon
47	—	J1, SEE ELECTRICAL PARTS LIST
48	—	J3, SEE ELECTRICAL PARTS LIST
49	—	J2, SEE ELECTRICAL PARTS LIST
50	—	CIRCUIT BOARD, interconnect
51	7-80079A01	BRACKET, IC board support
52	42-13217A26	STRAP, cable harness
53	29-1027A15	PIN, terminal; 8 used
54	—	J901, J1003, SEE ELECTRICAL PARTS LIST
55	—	P1004, SEE ELECTRICAL PARTS LIST
56	—	CIRCUIT BOARD (UHF)
57	—	P10, SEE ELECTRICAL PARTS LIST
58	—	P11, SEE ELECTRICAL PARTS LIST
59	—	P601 thru P604, SEE ELECTRICAL PARTS LIST
60	—	P605 thru P608, SEE ELECTRICAL PARTS LIST
61	15-80272B01	HOUSING filter
62	64-80270B01	PLATE, filter housing
63	46-80009A01	STUD, coil (M6 x 1), 6 used
64	46-80010A01	STUD, coil (M8 x 1), 6 used
65	3-80012A03	SCREW, set (M6 x 1); 6 used
66	3-80256A01	SCREW, set (M8 x 1.25); 6 used
67	2-80045A03	NUT, retainer (M6 x 1), 6 used
68	2-80045A02	NUT, retainer (M8 x 1.25), 6 used
69	3-10936B06	SCREW, tapping (M3.5 x 1.27 x 8); 19 used
70	2-7003	NUT (8-32 x 5/16 x 1/4") (50W models)
71	4-80083A01	WASHER, stud device (50W models)
72	32-80076A01	GASKET, bottom inner
73	32-80080A01	GASKET, antenna connector
74	2-80006A01	NUT, spanner
75	4-114522	WASHER, lock
76	14-80077A01	INSULATOR, PA compartment (30 50W models)
	or 14-80142A01	INSULATOR, PA compartment (75/100W models)
77	7-80078A01	BRACKET, thermistor mounting
78	—	BOARD, power distribution
79	29-80014A01	CLIP, coax
80	7-80157A01	SUPPORT, transistor PA (30-50W models)
81	15-80903A01	HOUSING, filter (30-50W models)
	or 15-80066B01	COVER, harmonic filter (75/100W models)
84	3-10906A10	SCREW, tapbte (M3.5 x 0.6 x 8); 2 used
85	64-80005A01	PLATE, feed-thru
86	4-7656	WASHER, lock (#6)
87	3-10905A05	SCREW (M30 x 0.5 x 8)
88	3-10904A15	SCREW, machine (M3 5 x 0.6 x 13)
89	42-80366A01	CLAMP, cable
90	14-80061B01	INSULATOR, housing
92	42-80289B01	CLIP, tray retainer
93	32-80020C01	GASKET, cable connector
94	4-7627	WASHER, flat, .125 x .281 x .027
100	26-80079B01	SHIELD, harmonic filter (75/100W models)
101		LO-LEVEL AMPLIFIER SUBSTRATE (75 100W models)
102	—	PREDRIVER (in substrate)(75 100W models)
103	—	DRIER (in substrate)(75/100W models)
104	—	PA MODULE BOARD (75-100W models), 5 used
105	26-80254A01	HEATSINK, low-level amplifier (75/100W models)
106	42 80137A02	HOLDER, substrate (75/100W models)
108	32 80084A01	STUD PLUG, gasket 2 used (75 100W models), 1 used (30/50W models)
109		COMBINER SUBSTRATE
110		SPLITTER SUBSTRATE
111		HARMONIC FILTER SUBSTRATE
112	64-80067B01	PLATE, harmonic filter
113	64-80074B01	GASKET, harmonic filter
114	9-80155A01	CONNECTOR, flat wafer; 7 used
115	29-00129B3	LUG, solder
116	75-80142B01	PAD, fracture
117	3-10936A10	SCREW, tapping (M3 5 x 1.27 x 10), 5 used
118	26-80263C01	SHIELD, rf
119	42 80010D01	STRAP, retaining, M6
120	42-80011D01	STRAP, retaining, M8
200	15-80273B03	HOUSING, preamp
201	1-80709T12	COVER AND SHIELD
202	3-10838B15	SCREW, tapping (B3 5 x 1.26 x 13)
203	3-10943D11	SCREW (TT2.5 x 0.45 x 6)
204	30-83794C01	CABLE, coax
208	9-84041D01	RECEPTACLE, banana plug
209	43-82942L01	SLEEVE
210	9-83663C01	RECEPTACLE, connector
212	30-10286B04	WIRE, 24 STN (red)
213	37-82603D60	SLEEVE, wire (2 used)
214	29-84706E02	SOCKET, terminal crimp (2 used)
215	30-10286B02	WIRE, 24 STN (black)
216	4-80217D01	WASHER, compression, 5 used

note: The MITREK radio uses metric hardware, and the RFX4062A MITREK Metric Hardware Kit is available from Motorola Parts

75 AND 100 WATT RADIOS



LOCK REMOVAL PROCEDURE



STEP 2 ROTATE LOCK BARREL TO UNLOCKED POSITION (SHOWN) USING KEY

STEP 3 REMOVE LOCK BARREL BY DEPRESSING SPRING CLIP USING A BLUNT PIN INSERTED THROUGH PUNCHED OUT HOLE (STEP 1) AND PULLING BARREL FORWORD OUT OF HOUSING.

STEP 4 REPLACE LOCK BARREL BY DEPRESSING SPRING CLIP AND SLIDING BARREL BACK INTO HOUSING UNTIL SPRING CLIP SNAPS BACK INTO POSITION

STEP 5 PLUG HOLE IN LOCK SLIDE SUPPORT (STEP 1) TO RESTORE WEATHER RESISTANT FEATURE OF RADIO

GBEPS-27667

parts list

LEGEND
L = 406-420 MHz
H = 450-512 MHz

HLE4021C Power Amplifier (UHF 50 W; 406-420 MHz) HLE4022C Power Amplifier (UHF 50 W; 450-512 MHz)
HLE4042A Transistor Kit (UHF PA 50 W; 406-420 MHz)
HLE4043A Transistor Kit (UHF PA 50 W; 450-512 MHz) PL-5986-D

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: pF ± 10%; 500 V: unless otherwise stated
C800	20-84579B10	variable 1.5-18.8
C801	21-83596E13	.001 uF; 1000 V
C802	21-83406D69	30; ± 5%
C803	21-84366F14	20 ± 5%
C804H	21-80169A36	16 ± 5%
C804L	21-83596E10	220 ± 20%
C805H	21-84366F05	45 ± 5%
C805L	21-84366F23	50 ± 5%
C806	21-83406D69	30; ± 5%
C807	23-84536G04	15 uF ± 20%; 20 V
C808H	21-80169A36	16 ± 5%
C808L	21-83406D95	14 ± 5%
C809	21-84366F05	45 ± 5%
C810	21-83596E13	.001 uF; 1000 V
C811	23-83210A22	560 uF + 150-10%; 25 V
C812H	21-84366F04	30 ± 5%
C812L	21-84366F09	25 ± 5%
C813H	20-84579B10	variable 1.5-18 8
C813L		not used
C814H	21-83406D53	3.3 ± .25 pF
C814L	21-83406D65	5 ± .25 pF
C815H	21-84366F04	30 ± 5%
C815L	21-84366F07	35 ± 5%
C816H	21-84366F04	30 ± 5%
C816L	21-84366F08	40 ± 5%
C817H	21-84366F04	30 ± 5%
C817L	21-84366F07	35 ± 5%
C818H	21-84366F04	30 ± 5%
C818L	21-84366F08	40 ± 5%
C819H	21-84366F07	35 ± 5%
C819L	21-84366F06	45 ± 5%
C820	21-84366F08	40 ± 5%
C821H	21-84366F07	35 ± 5%
C821L	21-84366F06	45 ± 5%
C822	21-84366F08	40 ± 5%
C824H		not used
C824L	21-84366F11	10 ± 5%
C825	21-84736E31	56, 50 V
C826, 827	21-83406D69	30 ± 5%
C828H	21-83406D65	5.0 ± .25 pF
C828L	21-83406D73	7.5 ± .5 pF
C831	21-83596E13	.001 uF; 1000 V
C833	21-83596E13	.001 uF
C834 thru 838	21-83596E13	.001 uF; 1000 V
C840, 841	21-83596E13	.001 uF; 1000 V
C842	21-83406D69	30 ± 5%
C843	21-82372C09	0.1 uF + 80-20%, 25 V
C845H	21-84366F10	20 ± 5%
C845L	21-84366F09	25 ± 5%
C846	21-84366F18	6 ± 5%
C847H	21-83596E13	.001 uF; 1000 V
C847L		not used
C848		not used
C850H	21-80169A36	16 ± 5%
C850L	21-83406D72	12 ± .5 pF
C851	21-82372C09	0.1 uF + 80-20%, 25 V
C863, 864	21-82372C09	0.1 uF + 80-20%, 25 V
C865	8-82905G30	0.1 uF; 500 V
C865L		not used
C891	21-83406D69	30 ± 5%
C892	21-82372C10	.05 ± 20%; 25 V
		diode: (see note)
CR801	48-82466H13	silicon
		coil:
L801	24-83884G08	5-1/2 turns; coded orange
L802	24-80041A06	5-1/4 turns
L803H	24-83884G06	4-1/2 turns; coded white
L803L	24-83884G07	2-1/2 turns; coded green
L811	24-83961B07	2 turns; coded yellow
L812 thru 816	24-80036A02	1/2 turns; (ferrite)
L817H		jumper
L817L	24-80036A01	1/2 turn; (ferrite)
L830H	76-84069B01	core (ferrite)
L830L		not used
L863, 864	24-83884G04	7-1/2 turns; coded yellow
L866, 867	24-83884G04	7-1/2 turns; coded yellow
L890	24-82835G23	33 uH
		transistor: (see note)
Q801	48-869867	NPN; type M9887
Q802	48-84411L05	NPN; type M1105
Q803	48-84411L08	NPN; type M1108
Q804, 805	48-84411L07	NPN; type M1107

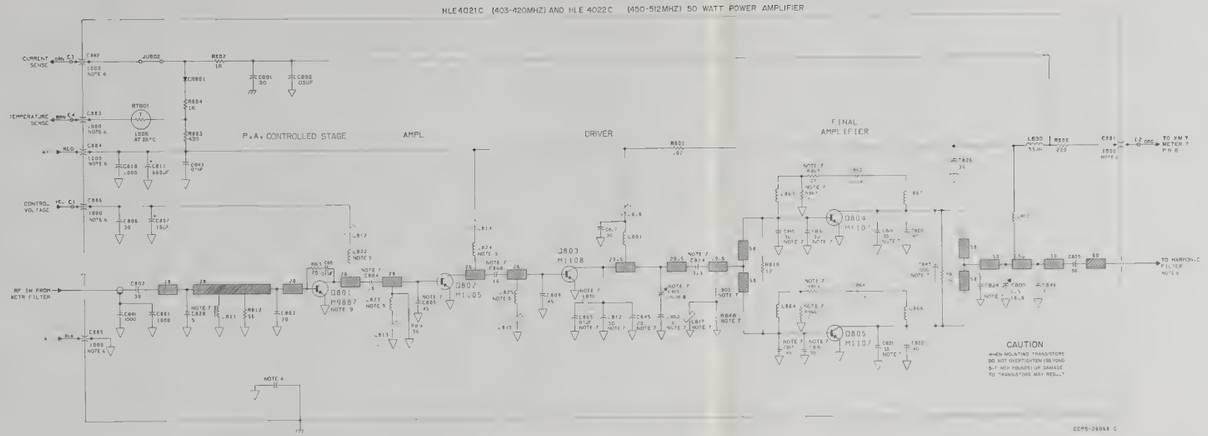
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		resistor, fixed: ± 5%; 1/4 W; unless otherwise stated
R801	17-80234B01	0.02 W; W; 5 W
R802	6-124A49	1k
R803	6-124A40	430
R804	6-124A49	1k
R806	6-124C33	220 ± 10%
R810, 811	6-125C03	12 ± 10%; 1/2 W
R812	6-124C19	56 ± 10%
R813	6-124A22	75
R814	6-124C19	56 ± 10%
R848H		not used
R848L	6-124B61	4.7
R863, 864H	6-125C11	27 ± 10%; 1/2 W
R863, 864L	6-125C09	22 ohms ± 10%; 1/2 W
R866, 867H	6-124C01	10 ± 10%; 1/4 W
R866, 867L	6-124C09	22 ohm ± 10%
		thermistor:
RT801	6-83600K09	100k @ 25°C
		mechanical parts
	29-80014A01	CLIP, coax
	30-83794C01	COAXIAL, cable
	7-80157A01	SUPPORT, PA transistor
	7-80078A01	BRACKET, thermistor; 2 used
	42-10217A26	STRAP, cable
	14-80077A01	INSULATOR, PA compartment
	3-10936A06	SCREW, tapping; (B3.5 x 1.27 x 8); 7 used
	3-10905A01	SCREW, machine (M3 x 0.5 x 8); 6 used
	4-80038A01	WASHER, stud
	2-7003	NUT 8-32 x 5/16 x 1/8
	26-80211A01	COVER, PA
	55-8400B04	HANDLE, cover

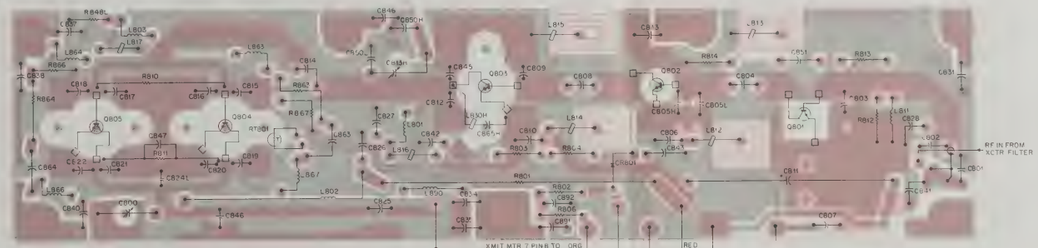
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers. Capacitors C803, C805, C809, C812, C815 thru C822, C824, C845 and C846 are not included in the Power Amplifier Kit or Transistor Kit. They must be ordered separately when replacement parts are needed, or when replacing Q803, Q804, or Q805

HLN4017A UHF Feed-thru Plate (PL) PL-5989-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C881 thru 886	21-82812H03	1000 pF + 100-0%; 500 V
		mechanical parts
	64-80005A01	PLATE, feed-thru
	3-10904A02	SCREW, machine (M3 x 0.6 x 6) 3 used

HLE4021C (403-420MHZ) AND HLE 4022C (450-512MHZ) 50 WATT POWER AMPLIFIER





REF SYM CODE	MODEL USED ON
L	HLE 4021C (403-420 MHZ)
H	HLE 4022C (450-512 MHZ)

TRANSISTOR BASE DETAILS

SHOWN FROM COMPONENT SIDE

COMPONENT SIDE : BD-EEPS-27802-A
SOLDER SIDE : BD-EEPS-27803-A
OL-EEPS-27804-B

NOTES

1 All parts may be removed from the top of the board

2 Unless otherwise specified
Resistor values are in ohms
Capacitor values are in picofarads

3 50 indicates microstrip transmission line. Number ▨ stands for characteristic impedance ZO

4 Capacitors C831, C833-8, C840, C842 are connected between circuit board ground and chassis ground

5 L822-5 are plated on board

6 Six feed-thru capacitors C881-6 and one harmonic filter are located below the circuit board and must be accessed from the bottom of the radio

7 Frequency range sensitive part. Indicated value is for 450 MHz. See parts list for 403-420 MHz part values

8 When soldering to or near the crimpled metal capacitors used in the harmonic filter and PA boards, take must be taken to avoid contact with the dielectric. If contact occurs the capacitor must be replaced

9 Q801 may be removed from the transistor support bracket without removing the bracket from the PA board

LEGEND
PRIMARY SIGNAL FLOW
CHASSIS REF
A — IPA REF

"MITREK" POWER AMPLIFIER

UHF 50 WATTS
MODELS HLE1011C (406-420 MHz)
HLE1012C (450-512 MHz)

FUNCTION

Increases power output of radio to 50 watts. Contains circuitry to sense temperature and current of final amplifier for application to power control and protection circuit in radio.

50 WATT POWER AMPLIFIER/30WATT POWER AMPLIFIER

68P81039E27-E
5-9-82 GGI

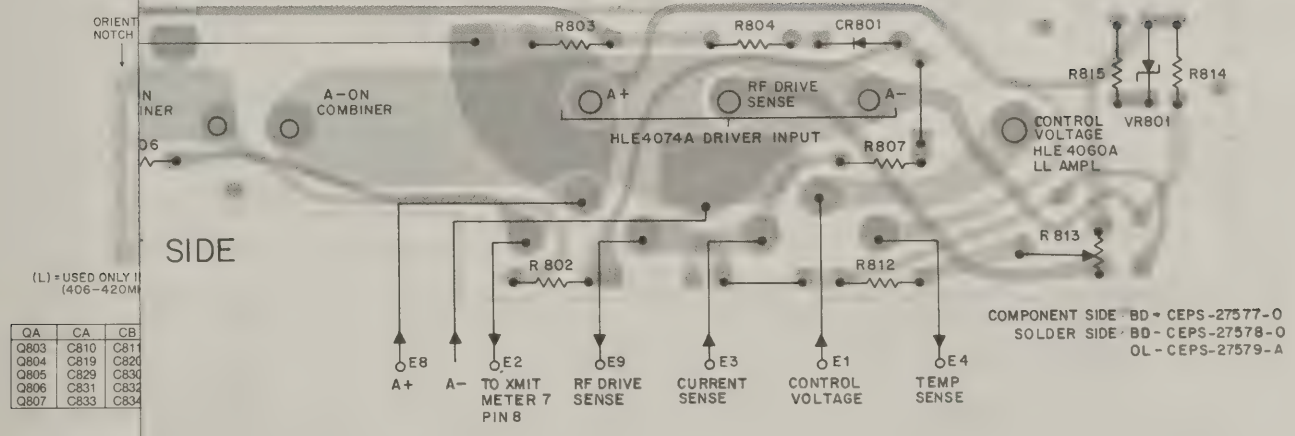
POWER AMPLIFIER

75/100 WATT
MODELS: HLE1031B (406-420 MHz)
HLE1032B (450-494 MHz)
HLE1033B (494-512 MHz)

FUNCTION

Increases power output of radio to 75 or 100 watts. Contains ciruitry to sense temperature and current of final amplifier for application to power control and protection circuit in radio.

TRANS 1A POWER DISTRIBUTION BOARD



QA	CA	CB
Q803	C810	C811
Q804	C819	C820
Q805	C829	C830
Q806	C831	C832
Q807	C833	C834

PARTS LIST SHOWN ON BACK

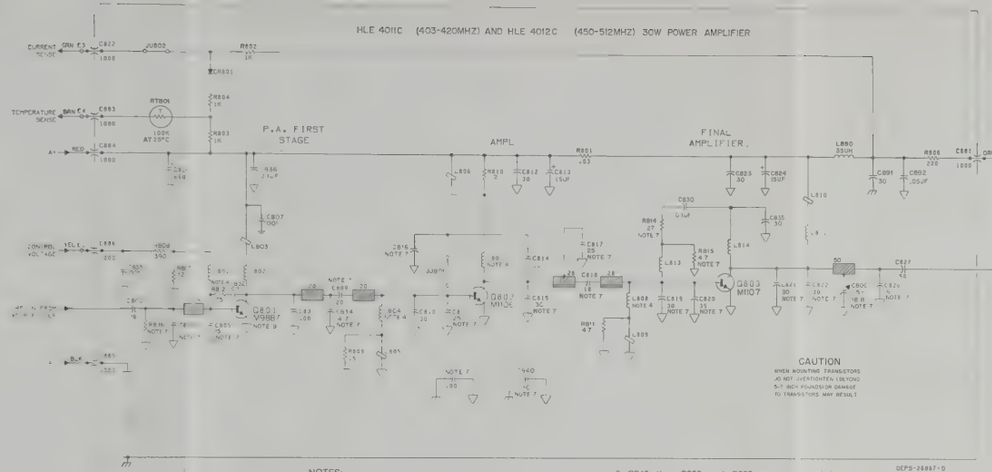
68P81041E33-B
5-9-82 GGI

"MITREK" POWER AMPLIFIER

UHF 30 WATTS
MODELS HLE1001C (406-420 MHz)
HLE1002C (450-512 MHz)

FUNCTION

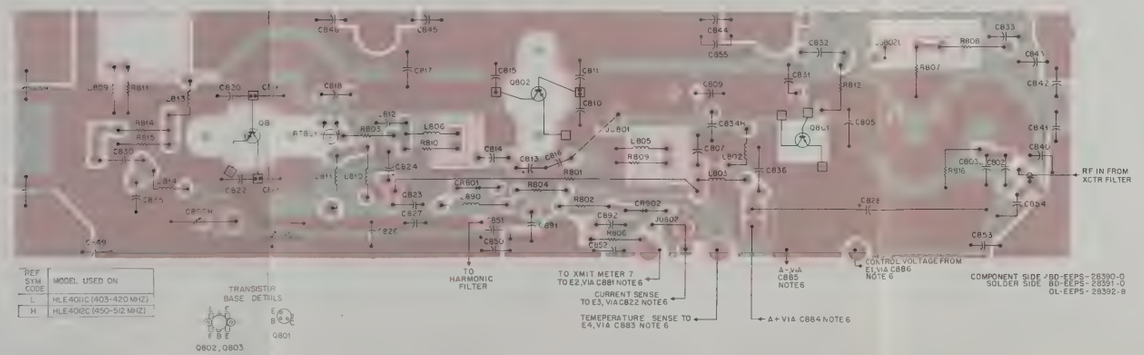
Increases power output of radio to 30 watts. Contains circuitry to sense temperature and current of final amplifier for application to power control and protection circuit in radio.



LEGEND:
- → — PRIMARY SIGNAL FLOW
- ⏚ = CHASSIS REF.
- ⏚ = A— (PA REF.)

NOTES:

1. All parts may be removed from the top of the board.
2. Unless otherwise specified, resistor values are in ohms and capacitor values are in picofarads.
3. 20 indicates microstrip transmission line. Number stands for characteristic impedance ZO.
4. L801, L804, L807, and L808 are plated on board.
5. Six feed-thru capacitors and one harmonic filter are located below the circuit board and must be accessed from the bottom of the radio.
6. C840 thru C853 and C855 are connected between chassis and circuit board ground.
7. Frequency range sensitive part. Indicated value is for 450-512 MHz. See parts list for 403-420 MHz part values.
8. When soldering to or near the crimped metal capacitors (used in the harmonic filter and PA board) care must be used to ensure that solder flux does not contact the dielectric; if contact occurs the capacitor must be replaced.
9. Q801 may be removed from the transistor support bracket without removing the bracket from the PA board.



REF SYM CODE	MODEL USED ON
L	HLE4011C (403-420 MHZ)
H	HLE4012C (450-512 MHZ)

68P81039E28-F
5-9-82 GGI

parts list

LEGEND
L = 406-420 MHz
H = 450-512 MHz

HLE4011C Power Amplifier (UHF, 30 W, 406-420 MHz)
HLE4012C Power Amplifier (UHF, 30 W, 450-512 MHz)
HLE4041A Transistor Kit (UHF, PA, 30 W) PL-5980-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: pF ±10%; 500 V; unless otherwise stated
C800H	20-84579B10	variable, 1.5-18 8
C800L	19-84774E03	variable, 2-10
C802	21-83406D55	18 pF ± 5%
C803H		not used
C803L	21-83406D66	2.7 ± 5%
C805H	21-84366F16	15 ± 5%
C805L	21 84366F14	20 ±5%
C807	21-83596E13	.001 µF; 1000 V
C809H	21 84366F14	20 ±5%
C809L	21-84366F11	10 ±5%
C810	21-84366F04	30 ±5%
C811H	21 84366F09	25 ±5%
C811L	21-84366F04	30 ±5%
C812	21-83406D69	30 ±5%
C813	23-84538G04	15 µF +20%, -20%; 20 V
C814	21-83255B62	1.0 ÷ 25 pF
C815H	21-84366F04	30 ±5%
C815L	21-84366F07	35 ±5%
C816H		not used
C816L	21-83406D75	1.5 pF ± .25 pF, NPO
C817H	21-84366F09	25 ±5%
C817L	21-84366F07	35 pF ±5%
C818H	21-83406D55	18 ±5%
C818L	21-83406D67	43 ±5%
C819H	21-84366F04	30 ±5%
C819L	21-84366F08	40 ±5%
C820H	21-84366F07	35 ±5%
C820L	21-84366F06	45 ±5%
C821H	21-84366F04	30 ±5%
C821L	21-84366F22	50 ±5%
C822H	21-84366F04	30 ±5%
C822L	21-84366F08	40 ±5%
C823H	21-83406D69	30 ±5%
C823L	21-82372C10	.05 µF +20%, 25 V
C824	23-84538G04	15 µF +20%, -20% 20 V
C826	21-84366F18	6 ±5%
C827	21-84736E31	56
C828	23-83210A22	660 µF +150, -10%, 25 V
C829		not used
C830	21-82372C09	0.1 µF +80, -20%, 25 V
C831	21 83596E13	.001 µF; 1000 V
C832	21-82372C09	0.1 µF +80, -20%, 25 V
C833	21-83596E13	.001 µF; 1000 V
C834H	21-82355B39	4.7 ± .25 pF
C834L		not used
C835	21-83406D69	30 ± 5%
C836	21-82372C09	0.1 µF +80, -20%; 25 V
C840H	21-83406D69	30 ± 5%
C840L	21-83596E13	.001 µF; 1000 V
C841	21 83596E13	.001 µF; 1000 V
C842H	21-83406D69	30 ± 5%
C842L		not used
C843 845	21-83596E13	.001 µF, 1000 V
C846H	21 83596E13	.001 µF, 1000 V
C846L		not used
C847-850	21-83596E13	.001 µF, 1000 V
C851H		not used
C851L	21-83596E13	.001 µF, 1000 V
C852 853	21-83596E13	.001 µF, 1000 V
C854		not used
C855H		not used
C855L	21-83596E13	.001 µF; 1000 V
C891	21-83406D69	30 ±5%
C892	21-82372C10	.05 ±20%, 25 V
CR801	48-82466H13	**diode: (see note)** silicon
L802	24-83884G01	**coil:** 3½ turns (code PINK)
L803,805,806, 809,810	24 8003GA02	½ turn ferrite
L811	24-83547G06	7½ turns (code YELLOW)
L813,814	24-83384G08	5½ turns (code ORANGE)
L890	24-82835G23	33 µH
Q801	48-869887	**transistor: (see note)** NPN, type M9887 (HLE4041A)
Q802	48-84411L06	NPN, type M1106 (HLE4041A)
Q803	48-84411L07	NPN; type M1107 (HLE4041A)
R801	17-80234B02	**resistor, fixed:** ±5%; ½ W: .03; 5 W
R802,803,804	6-11009C49	1K
R806	6-11009C33	220
R807	6-11009C03	12
R808	6-125A39	390; ½ W
R809	6-11009C05	15
R810	6-11009C03	12
R811	6-124B61	4.7
R812	6-11009C22	75
R814H	6-125A11	27; ½ W
R814L	6-125A17	47
R815H	6-124B61	4.7
R815L	6-11009C01	10
R816H		not used
R816L	6-11009C38	360
RT801	6-83600K09	**thermistor** 100k at 25°C
		mechanical parts
	29-80014A01	CLIP, coax
	30-83794C01	CABLE, coaxial
	7-80157A01	SUPPORT, PA transistor
	7-80078A01	BRACKET, thermistor
	42-10217A26	STRAP, cable
	14-80077A01	INSULATOR, PA compartment
	3-10936A06	SCREW, tapping (B3.5 x 1.27 x 8), 7 used
	3-10905A01	SCREW, machine (M3.0 x 0.5 x 6), 4 used
	32-80084A01	GASKET, stud device
	26-80211A01	COVER, PA
	55-84300B04	HANDLE, cover
	14-80255B01	INSULATOR, trimmer

note: For optimum performance, order diodes, transistors, and integrated circuits by Motorola part numbers. Capacitors C805 thru C809, C811, C815, C817, C819 thru C822, and C825 are not included in the power amplifier kit or the transistor kit. They must be ordered separately when replacement parts are needed, or when Q803, Q804, or Q805 are replaced.

HLN4017A UHF-Feed-Thru Plate (PL) PL-5989-B

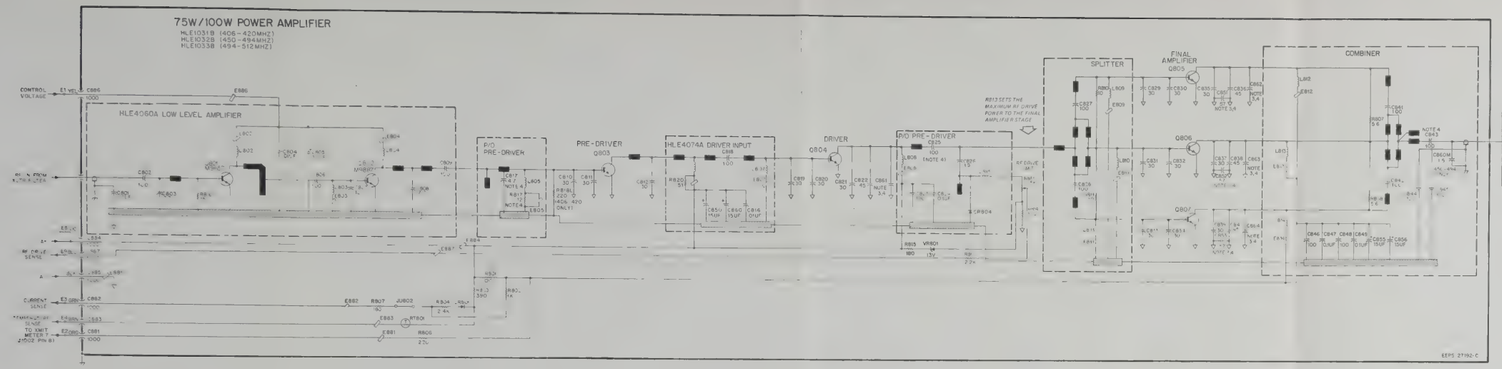
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C881 thru 886	21-82812H03	1000 pF, +100, -0%; 500 V
		mechanical parts
	64-80005A01	PLATE, feed-thru
	3-10904A02	SCREW, machine (M3 x 0.6 x 6), 3 used

POWER AMPLIFIER

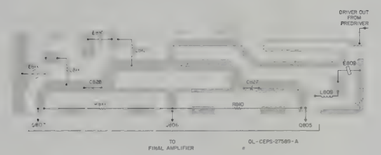
75/100 WATT
MODELS: HLE1031B (406-420 MHz)
HLE1032B (450-494 MHz)
HLE1033B (494-512 MHz)

FUNCTION

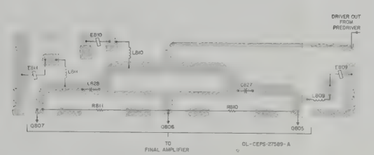
Increases power output of radio to 75 or 100 watts. Contains circuitry to sense temperature and current of final amplifier for application to power control and protection circuit in radio.



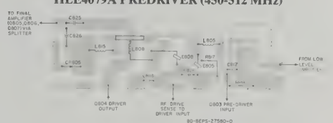
HLE4069A SPLITTER (406-420 MHz)



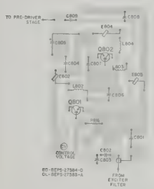
HLE4070A SPLITTER (450-512 MHz)



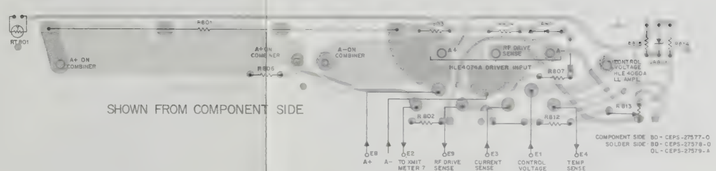
HLE4078A PREDRIVER (406-420 MHz)
HLE4079A PREDRIVER (450-512 MHz)



HLE4060A LOW LEVEL AMPLIFIER

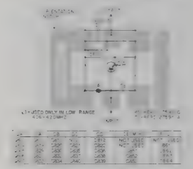


HLE4151A POWER DISTRIBUTION BOARD

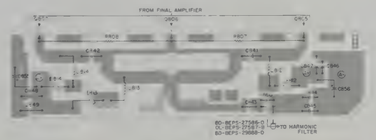


SHOWN FROM COMPONENT SIDE

TRANSISTOR SUBSTRATE



HLE4064A COMBINER (406-420 MHz)



HLE4065A COMBINER (450-494 MHz)
HLE4066A COMBINER (494-512 MHz)

HLE4074A DRIVER INPUT

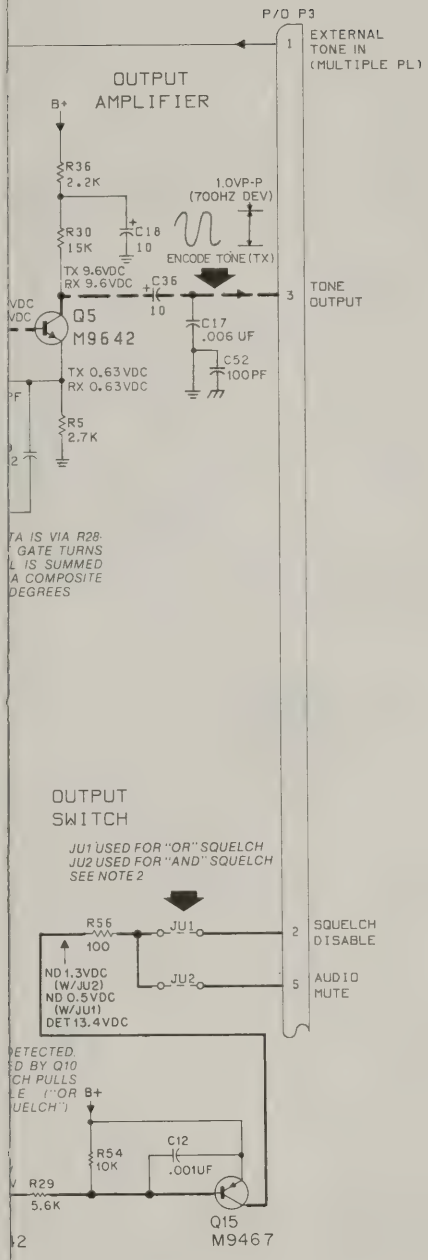
PARTS LIST SHOWN ON BACK

68P81041E33-B
5-9-82 GGI

POWER AMPLIFIER

TONE "PRIVATE-LINE" ENCODER/DECODER

MODEL HLN4020B



FUNCTION

Encodes and decodes sub-audible "Private-Line" tones. Encoder modulates transmitter and delays transmitter turn-off 200 ms to allow transmission of turn-off reverse tone burst. Decoder detects received tone and unsquelches receiver when proper tone is received.

68P81039E22-F
5-9-82 GGI

parts list

LEGEND
L = 406-420 MHz
M = 450-494 MHz
H = 494-512 MHz

HLE4151A Power Distribution Board — PL-6902-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		diode: (see note)
CR801	48-82466H13	silicon
		resistor, fixed: ±5%; ¼ W
R801	17-82155M01	.012
R802	6-11009C49	1k
R803	6-11009C39	390
R804	6-11009C58	2.4k
R806	6-11009C33	220
R807	6-11009C25	100
R812	6-11009C57	2.2k
R813	18-83311K04	variable; 2.5k
R814	6-11009C25	100
R815	6-11009C31	180
		thermistor:
RT801	6-83600K09	100k @ 25°C
		voltage regulator:
VR801	48-82256C50	Zener type; 13 V
		mechanical parts
	9-80155A01	CONNECTOR, flat wafer; 7 used

HLE4060A Low Level Amplifier — PL-6267-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C801	21-84547A13	0.1 uF ±10%; 50 V
C802	21-5157A07	100 pF ±20%; NPO
C803	21-5632D37	7.7 pF ±.25 pF; 25 V
C804	21-84547A05	.01 uF ±10%; 50 V
C805	23-83214C04	1.0 uF ±20%; 25 V
C806	21-5157A07	100 pF ±20%; NPO
C807	21-84873H36	12 pF ±.10%; NPO
C808	21-5632D37	7.7 pF ±.25 pF; 25 V
C809	21-5157A07	100 pF ±20%; NPO
		ferrite bead:
E802 thru 804	76-83960B01	.138 ODX .118 LG
		coil:
L802	24-5486C60	choke
L803, L804	24-80071B02	choke; 7 turns
		transistor (see note):
Q801	48-869657	NPN; type M9657
Q802	48-869887	NPN; type M9887
		resistor, fixed:
R816	6-124C05	15 ±10%; 1/4 W

HLE4064A Combiner (L)
HLE4065A Combiner (M)
HLE4066A Combiner (H) — PL-6268-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C841 thru 845M, H	21-84736E21	100 pF ±5%; 50 V
C843L	21-84736E12	39 pF ±5%, 50 V
C846	21-5157A61	100 pF ±5%; 50 V
C847	21-84547A13	0.1 uF ±10%; 50 V
C848	21-5157A61	100 pF ±5%; 50 V
C849	21-84547A13	0.1 uF ±10%; 50 V
C855, 856	23-82783B24	33 uF ±10%; 25 V
		ferrite bead:
E812, 813, 814	76-83960B01	.138 0D X .118 LG
		coil:
L812, 813, 814	24-80071B01	choke; 6 turns
		resistor, fixed:
R807, 808	6-126D63	5.6 ±10%; 1 W

HLE4069A Splitter (L)
HLE4070A Splitter (M, H) — PL-6269-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C827, 828	21-84736E21	100 pF ±5%; 50 V
		ferrite bead:
E809, 810, 811	76-83960B01	.138 0D x .118 LG
		coil:
L809, 810, 811	24-80071B01	choke; 6 turns
		resistor, fixed:
R810, 811	6-126C01	10 ±10%; 1 W

HLN4074A Driver Input Substrate — PL-6270-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C816	21-84547A05	.01 μF ±5%; 50 V
C818	21-5157A07	100 pF ±20%
C850	23-82783B24	15 μF ±20%; 25 V
C860	23-82783B24	15 μF ±20%; 25 V
		ferrite bead:
E806, 807	76-83960B01	.138 OD x .118 LG
		coil:
L806, 807	24-80071B01	choke; 6 turns
		resistor, fixed:
R820	6-11009C18	51

HLE4078A Pre-Driver Substrate (L)
HLE4079A Pre-Driver Substrate (M,H) — PL-6271-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C817L	21-84736E15	12 pF ±5%
C817M, H	21-84736E19	4.7 pF ±.25 pF
C823	21-51517A61	100 pF ±5%; 50 V
C824	21-84547A13	0.1 μF ±5%; 50 V
C825L	21-84736E29	7.5 pF ±.25 pF
C825M, H	21-84736E21	100 pF ±5%; 50 V
C826	21-5632D43	1.8 pF ±.25 pF; 50 V
		diode: (see note)
CR804	48-84616A01	hot carrier
		ferrite bead:
E805, 808	76-83960B01	.138 OD; .118 LG
		coil:
L805, 808	24-80071B01	choke, 6 turns
L815	24-82723H04	choke, .29 μH
		resistor, fixed:
R817L		not used
R817M, H	6-124A03	12 ±5%; ¼ W
		mechanical parts
	55-80065B01	STRAP, driver
	55-80335A01	STRAP, driver line

HLN4008B UHF Power Amplifier Hardware Kit (L)
HLN4009A UHF Power Amplifier Hardware Kit (M,H) — PL-6273-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		ferrite bead:
E881 thru 887	76-84069B02	.140 OD; .234 LG
		resistor, fixed:
R817	6-11009C97	100k ±10%; ¼ W
R818L	6-125A33	220; ½ W
		capacitor, fixed:
C860M	21-83406D75	1.5 pF ±.25; NPO
		mechanical parts
	2-80006A01	NUT, spanner
	3-10904A02	SCREW, machine (M3.5 x 0.6 x 6); 3 used
	3-10905A01	SCREW, machine (M3 x 0.5 x 6); 10 used
	3-10936A06	SCREW, tapping (B3.5 x 1.27 x 8); 5 used
	3-10936A10	SCREW, tapping (B3.5 x 1.27 x 10); 5 used
	4-114522	LOCKWASHER, ⅝" internal
	7-80242B01	BRACKET, thermistor
	14-80142A01	INSULATOR, PA
	15-80066B01M,H	COVER, filter
	15-80135A01	HOUSING
	26-80079B01M,H	SHIELD, filter
	26-80254A01	HEATSINK
	32-80074B01M,H	GASKET; 2 used
	32-80080A01	GASKET, antenna connector
	32-80084A01	GASKET, stud device; 2 used
	42-60013A01	CLIP, coaxial; 2 used
	42-80137A01	HOLDER, substrate

HLN4046A Feed-Thru Plate — PL-6274-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed; pF
C881 thru 887	21-82812H03	1000 pF + 100-0%; 500 V
		mechanical parts
	4-83755H01	WASHER, solder; 7 used
	64-80005A01	PLATE, feed-thru

HLN4229A Capacitor Kit (L) — PL-7024-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C861	21-85596E13	.001 uF ±10%; 500 V
C862 thru 864	21-83406D69	30 pF ±5%; 500 V

HLN4040A Capacitor Kit (M, H) — PL-6856-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed
C851 thru 853	21-84493B31	57 pF ±5%; 200 V
	or 21-82934H16	60 pF ±5%; 500 V

Harmonic Filter — PL-6889-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
801	HFE4000A	406-420 MHz; 30/50 Watt
	HFE4001A	450-512 MHz; 30/50 Watt
	HFE4002A	406-420 MHz; 75/100 Watt
	HFE4003A	450-512 MHz; 75/100 Watt

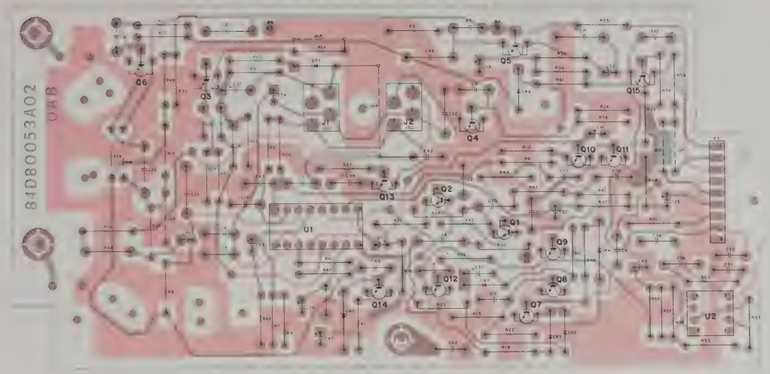
HLE4082A Power Transistor Kit (406-420 MHz)
HLE4083A Power Transistor Kit (456-494 MHz)
HLE4084A Power Transistor Kit (494-512 MHz) — PL-6857-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: ±5%; 250 V
C810, 811	21-84366F04	30 pF
C812	21-84736E33	30 pF
C819, 820, 821	21-84366F04	30 pF
C822	21-84366F06	45 pF
C829 thru 834	21-84366F04	30 pF
C835, 837, 839	21-84366F04	30 pF
C836, 838, 840	21-84366F06	45 pF
		transistor: (see note)
Q803	1-80701T78	module kit includes C810, 811, 812
Q804-807L,M	1-80703T04	module kit includes C819-822, C829-840
	or 1-80705T41	module kit includes C819-822, C829-840
Q804-807H	1-80701T77	module kit includes C819-822, C829-840
	or 1-80705T42	module kit includes C819-822, C829-840

note

Transistors Q804 - Q807 must be from the same module kit number and cannot be intermixed. When ordering a replacement transistor in a power transistor kit, order it by the module kit number stamped on the module and not by its transistor number

note: For optimum performance, order diodes, transistors, and integrated circuits by Motorola part numbers.



SHOWN FROM SOLDER SIDE

COMPONENT SIDE 80-SEPS-29953-O
SOLDER SIDE 80-SEPS-29954-O
01-SEPS-29955-O

parts list

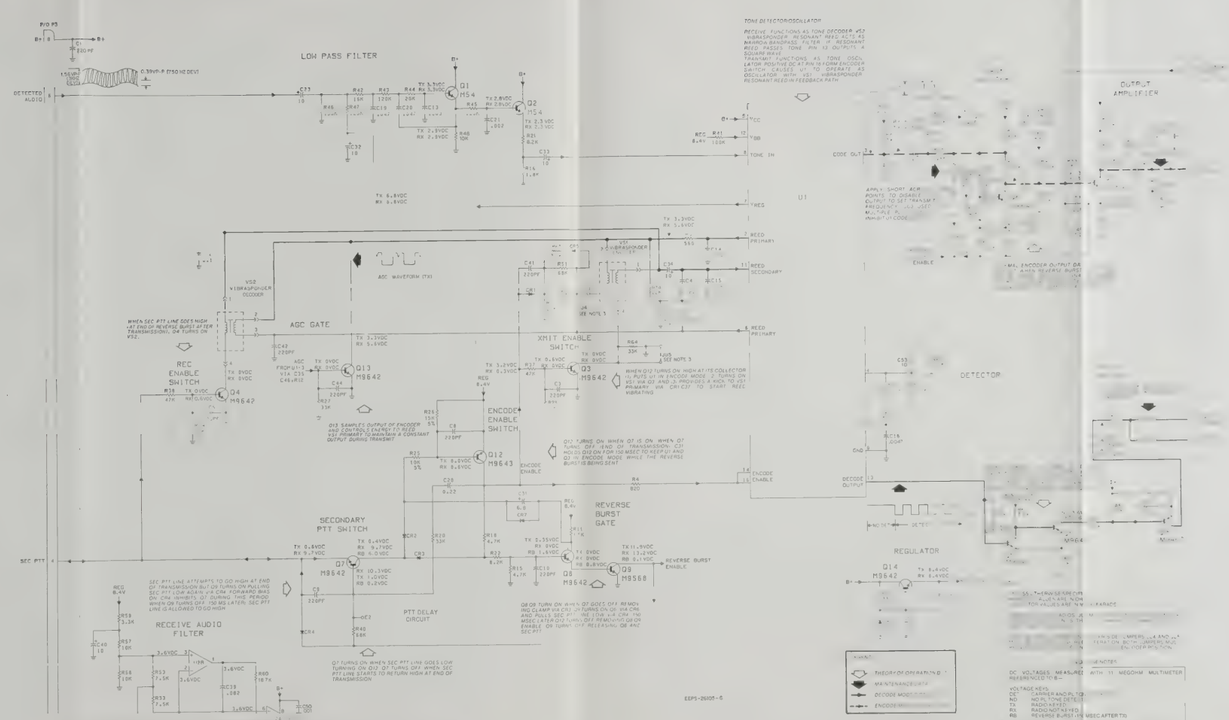
HLN4020B Tone "Private-Line" Encoder/Decoder Board FL 6029 G

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C1 thru 10	21-833VAE10	220 pF ±20%, 500 V
C11	21-845B95	1 µF, −20% 35 V
C12	21-821B184	001 µF ± 10%, 100 V
C13	21-821B184	003 µF ± 10%, 100 V
C14, 15, 16	21-833VAE39	0047 µF ± 10%, 100 V
C17	21-833VAH8	006 µF ± 10%, 100 V
C18	21-845B95E01	10 µF +100, −10%, 32 V
C19, 20	21-845B95J01	047 µF ± 10% 250 V
C21	21-821B267	002 µF ± 10% 200 V
C22	21-827TC09	0.1 µF +80, −20%, 25 V
C23	21-845B95F01	10 µF + 100, − 10%, 25 V
C25 thru 28	21-845B95J02	0.22 µF ± 10% 100 V
C29	21-845B95R14	1 µF +150, −10%, 50 V
C31	21-845B95Q20	0.8 µF ± 10% 20 V
C32 thru 36	21-845B95F01	10 µF + 100, − 10%, 25 V
C37	21-845B95J02	15 µF ± 20% 20 V
C38	21-845B73J2	0.1 µF ± 5% 100 V
C39	8-5802-136	082 µF ± 5% 100 V
C40	21-845B95F01	10 µF ± 100, − 10%, 25 V
C41 thru 44	21-835VAE50	220 pF ± 20% 500 V
C45	21-845B95E06	0.1 µF + 80, − 20%, 25 V
C47	21-845B95F13	10 µF + 100, − 10%, 25 V
C48	21-835VAE10	220 pF ± 20% 500 V
C49	21-845B73J2	0.22 µF ± 10% 100 V
C50	21-821B184	001 µF ± 10% 100 V
C51	21-835VAE10	220 pF ± 20% 500 V
C52	21-845B95J01	100 pF ± 10% N750
C53	21-845B95F01	10 µF + 100, − 10%, 25 V
		diode (see note)
CR1, 2, 3	48-836549C1	silicon
CR4	48-807TA83	germanium
CR5, 6, 7	48-836549C1	silicon
		connector, receptacle
J1,2	9-80132A01	J1 & J2 each consist of four 9-80132A01 parts
		connector, plug
P1	28-BC181B02	male 9 contact

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		transistor: (see note)
Q1, 2	48-134674	NPN; type M54
Q3 thru 8	48-869642	NPN; type M9642
Q9	48-869568	NPN; type M9568
Q10, 11	48-869642	NPN; type M9642
Q12	48-869643	PNP; type M9643
Q13, 14	48-869642	NPN; type M9642
Q15	48-869467	PNP, type M9467
		resistor, fixed ± 10%; 1/4 W; unless otherwise stated
R1	6-124A37	330
R2	6-124A44	620 ± 5%
R3	6-124C43	560
R4	6-124C47	820
R5	6-124A59	2.7k ± 5%
R6	6-124C61	3.3k
R7	6-124A53	1.5k
R8	6-124A80	3k ± 5%
R9	6-124C57	2.2k
R10	6-124C49	1k
R11	6-124A53	1.5k ± 5%; 1/4 W
R12	6-124A81	22k ± 5%
R13	6-124A61	3.3k ± 5%
R14	6-124A61	3.3k ± 5%
R15	6-124A65	4.7k ± 5%
R16	6-124C53	1.8k
R17	6-124A71	8.2k ± 5%
R18	6-124A65	4.7k ± 5%
R20	6-124A85	33k ±5%; 1/4 W
R21	6-124C71	8.2k
R22	6-124A71	8.2k ± 5%
R23 thru 24	6-124C73	10k
R25	6-124A73	10k ± 5%
R26	6-124A77	15k ± 5%
R27	6-124C85	33k
R28, 29	6-124A67	5.6k ± 5%
R30	6-124A77	15k ± 5%
R32	6-124A81	22k ± 5%
R33	6-10621C79	7.5k ± 1%; 1/8 W
R34	6-124C81	22k
R35	6-124C83	27k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R36	6-124C57	2.2k
R37, 38	6-124C89	47k
R39	6-124A89	47k ± 5%; 1/4 W
R40	6-124A73	10k ± 5%
R41	6-124C97	100k
R42	6-124A78	16k ± 5%
R43	6-124A99	120k ± 5%
R44	6-124A80	20k ± 5%
R45	6-124A99	120k ± 5%
R46	6-124D02	150k
R47	6-124C99	120k
R48	6-124C73	10k
R49	6-124A89	120k ± 5%
R50	6-124A93	68k ± 5%
R51	6-124C93	68k
R53	6-10621C79	7.5k ± 1%; 1/8 W
R54	6-124C73	10k
R55	6-124A49	1k ± 5%
R56	6-124C25	100
R57, 58	6-10621C91	10k ± 1%; 1/8 W
R59	6-124A61	3.3k ± 5%
R60	6-10621D18	18.7k ± 1%; 1/8 W
R61	6-124C73	10k
R62	6-124C57	2.2k
R63	6-124C61	3.3k
R64	6-124C85	33k
		integrated circuit: (see note)
U1	51-84768F76	type M6876
U2	51-84621K76	type M2176
		voltage regulator:
VR5	48-82258C38	zener type, 9.1 V
		mechanical parts
	3-10904A02	SCREW, machine (M3.5 x 0.6 x 6) 3 used
	3-10904A15	SCREW, machine (M3.5 x 0.6 x 13) 3 used
	4-80149A01	WASHER, captivative; 4 used
	7-80233A01	BRACKET, reed hold-down
	29-10271A15	TERMINAL, pin: 3 used
	46-80174A01	STUD
	75-80173A01	COMPRESSION PAD, 2 used

note: for optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



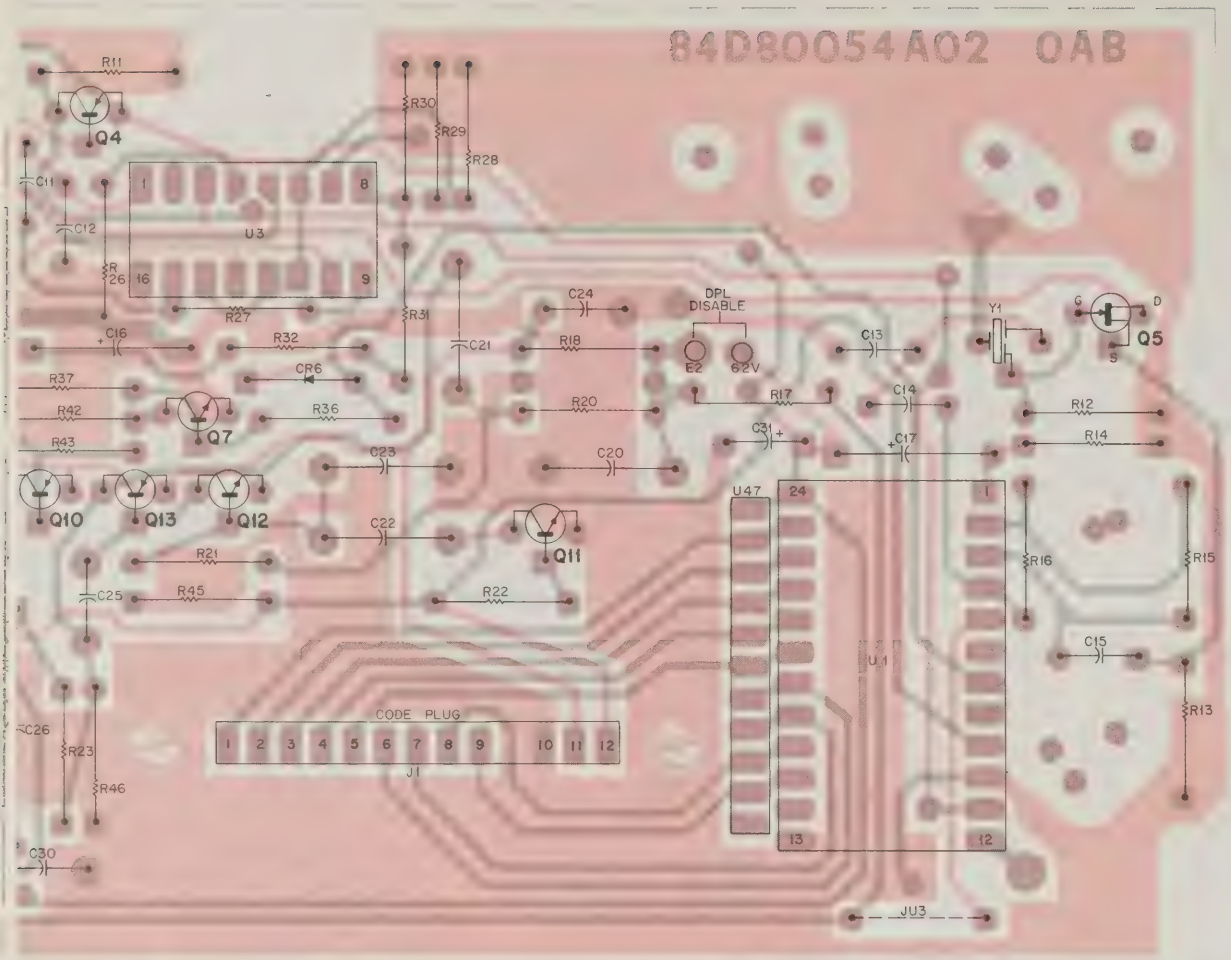
TONE "PRIVATE-LINE" ENCODER/DECODER

MODEL HLN4020B

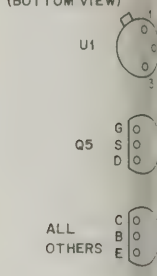
FUNCTION

Encodes and decodes sub-audible "Private-Line" tones. Encoder modulates transmitter and delays transmitter turn-off 200 ms to allow transmission of turn-off reverse tone burst. Decoder detects received tone and unsquelches receiver when proper tone is received.

68P81039E22-F
5-9-82 GGI



TRANSISTOR BASE DETAILS (BOTTOM VIEW)



SHOWN FROM SOLDER SIDE

COMPONENT SIDE: 8D-DEPS-26100-B
SOLDER SIDE: 8D-DEPS-26099-B
OL-DEPS-26098-B

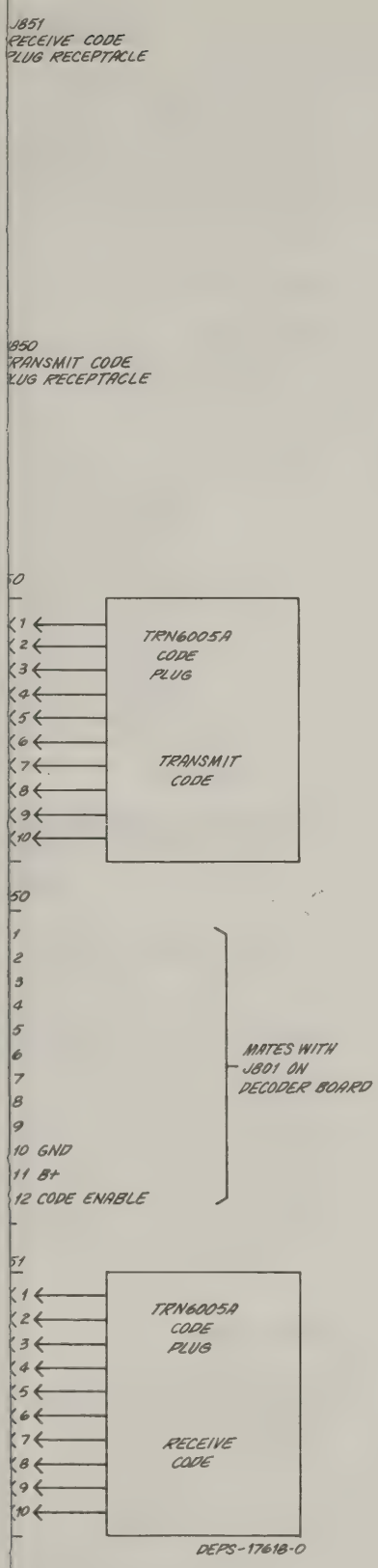
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		transistor: (see note)
Q1	48-869648	NPN; type M9648
Q2	48-869642	NPN; type M9642
Q3, 4	48-869643	PNP; type M9643
Q5	48-869653	FET; type M9653
Q6	48-869643	PNP; type M9643
Q7	48-869642	NPN; type M9642
Q8	48-869568	NPN; type M9568
Q9, 10	48-869643	PNP; type M9643
Q11, 12	48-869642	NPN; type M9642
Q13	48-869643	PNP; type M9643
		resistor, fixed: ± 5%; 1/4 W; unless otherwise stated
R1	6-124A93	68k
R2	6-124A99	120k
R3, 4, 5	6-10621D64	56.2k ± 1%; 1/8 W
R6	6-124A55	1.8k
R7, 8	6-124A73	10k
R9	6-124C59	2.7k ± 10%
R10	6-124A73	10k
R11	6-124A83	27k
R12	6-124B08	270k
R13	6-124A77	15k
R14	6-124A97	100k
R15	6-124B04	180k
R16	6-124B14	470k
R17	6-124A91	56k
R18	6-124A92	62k
R20, 21	6-124A97	100k
R22	6-124C75	12k ± 10%
R23	6-124A77	15k
R24	6-124A33	220 ohms
R25	6-124A33	220 ohms
R26	6-124A73	10k
R27	6-124A89	47k
R28	6-10621D80	82.5k ± 1%; 1/8 W
R29	6-124B14	470k
R30	6-124C95	82k ± 10%
R31	6-124C99	120k ± 10%
R32	6-124C95	82k ± 10%
R33	6-124C49	1k ± 10%
R34	6-124A93	68k
R35	6-124A79	18k

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R36	6-124C99	120k ± 10%
R37	6-124C95	82k ± 10%
R38	6-124A89	47k
R39	6-124D02	150k
R40	6-124A73	10k
R41	6-124A49	1k
R42, 43	6-124C89	47k ± 10%
R44	6-124D08	270k ± 10%; 1/4 W
R45	6-124A93	68k
R46	6-124A49	1k
R48	6-124C33	220 ohms ± 10%
R49	6-11009C99	120k
		integrated circuit: (see note)
U1	51-84267A82	type M6782
U2	51-84320A55	type LM565CN
U3	51-84320A79	type CA3096AE
U47	51-82142K02	resistor network
		voltage regulator: (see note)
VR10	48-83696E07	Zener, 6.2 V
VR11	48-82256C11	Zener, 10 V
VR12	48-82256C51	Zener, 5.1 V
		crystal, resonator:
Y1	48-82003K01	50 kHz
		mechanical parts
	14-861196	INSULATOR, transistor
	3-10904A02	SCREW, machine: M3.5 x 0.6 x 6
	3-10904A15	SCREW, machine: M3.5 x 0.6 x 13; 3 used
	4-80149A01	WASHER, captive; 4 used
	29-10271A15	TERMINAL, pin; 2 used

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

"DIGITAL PRIVATE-LINE" TWO-CODE ADAPTER

MODEL TLN5730A



APPLICATION —

Plugs into code plug receptacle on "Digital Private-Line" decoder or encoder-decoder to allow separate "Digital Private-Line" codes for transmit and receive. Code plugs for the two codes then plug into the receptacles on the two-code adapter board.

PARTS LIST

TLN5730A 2-Code Adapter Board — PL-3414-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR850 thru 867	48-83654H01	DIODE: (SEE NOTE) silicon
J850, 851	9-82071K01	CONNECTOR, receptacle: female; 12-contact
P850		CONNECTOR, plug: consists of: 28-82070K01 CONTACT, male; 13 req'd.
Q850, 851	48-869642	TRANSISTOR: (SEE NOTE) NPN; type M9642
R850, 852, 853, 856	6-124A73	RESISTOR, fixed: 10k ±5%; 1/4 W
R851, 854	6-124A65	4.7k ±5%; 1/4 W
NON-REFERENCED ITEMS		
	1V80769B88	CIRCUIT BOARD ASSY., incl. referenced item P850
	3-138804	SCREW, machine: 4-40 x 5/16"; 2 req'd.

NOTE: For optimum performance, diodes and transistors must be ordered by Motorola part number.

LEGEND

THEORY INFORMATION

DPL TWO-CODE ADAPTER/MITREK ACCESSORIES

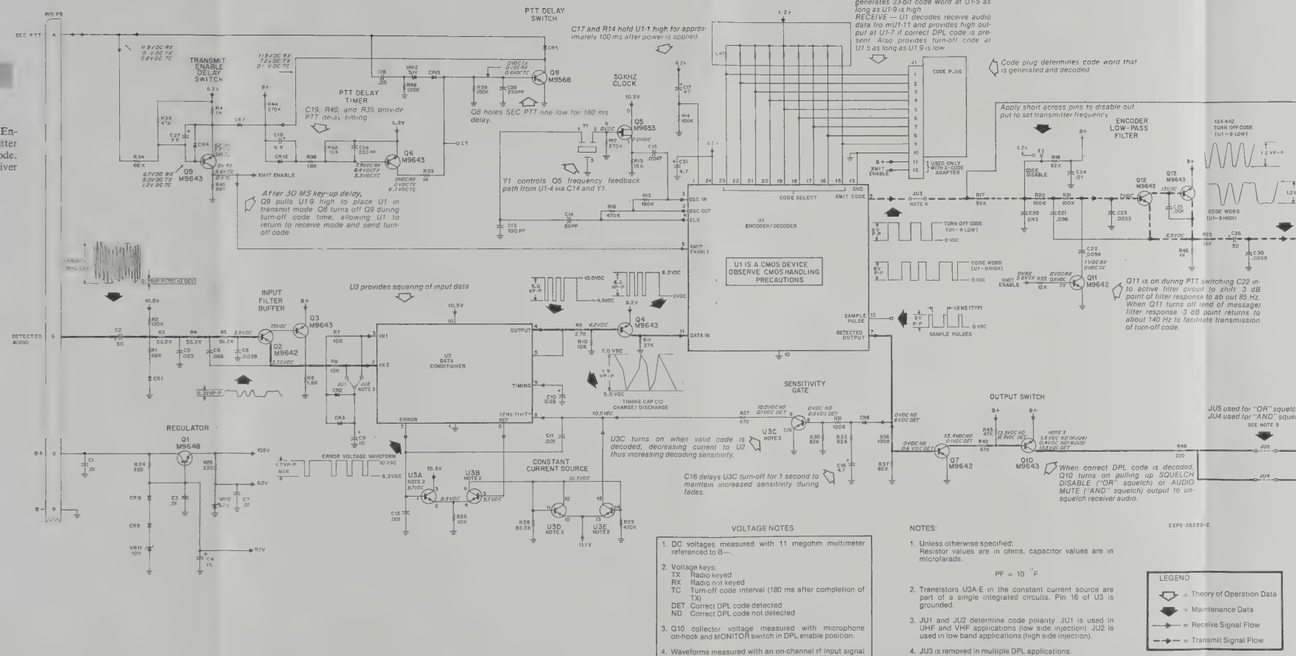
68P81106E97-B
5-9-82 GGI

DIGITAL PRIVATE-LINE
ENCODER/DECODER

MODEL HLN4011A

FUNCTION

Encodes and decodes *Digital Private-Line codes*. Encoder modulates transmitter and delays transmitter turn-off 150 ms to allow transmission of turn-off code. Decoder detects received tone and unsquelches receiver when proper code is received.



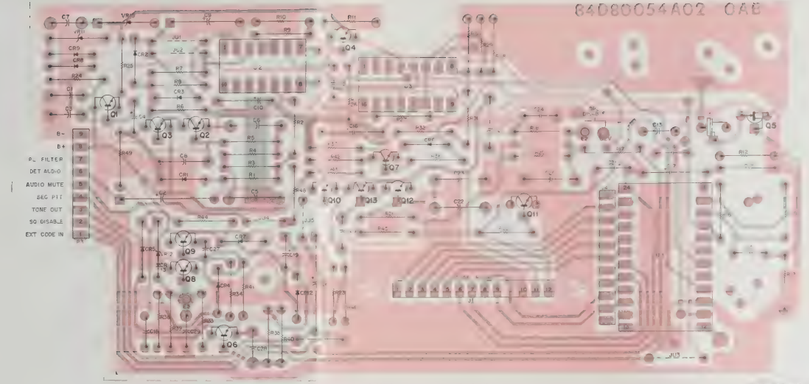
VOLTAGE NOTES

1. DC voltages measured with 11 megohm multimeter referenced to B—.
2. Voltage keys:
   TX Radio keyed
   RX Radio not keyed
   TC Turn-off code interval (180 ms after completion of TA)
   DET Correct DPL code detected
   ND Correct DPL code not detected
3. Q10 collector voltage measured with microphone on-hook and MONITOR switch in DPL enable position.
4. Waveforms measured with an on-channel rf input signal of 1000 uV modulated with 1000 Hz at ±4.25 kHz deviation and a digitally coded squelch signal at 750 Hz deviation (total deviation ±5 kHz).

NOTES:

1. Unless otherwise specified:
   Resistor values are in ohms, capacitor values are in microfarads.
   $PF = 10^{-6}F$
2. Transistors U3A-E in the constant current source are part of a single integrated circuits. Pin 16 of U3 is grounded.
3. JU1 and JU2 determine code polarity. JU1 is used in UHF and VHF applications (low side injection) JU2 is used in low band applications (high side injection).
4. JU3 is removed in multiple DPL applications.
5. For busy flight radios, JU4 must be out and JU5 in. AND/OR squelch selection is then determined by JU400 on Busy Light Adapter Board (see receiver schematic)

LEGEND
- = Theory of Operation Data
- = Maintenance Data
- = Receive Signal Flow
- = Transmit Signal Flow



SHOWN FROM SOLDER SIDE

parts list

HLN4011A "Digital Private-Line" Encoder/Decoder Board — PL-6050-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: µF ±5%, 50 V; unless otherwise stated
C1	21-83596E36	.01 – 60, – 40%, 250 V
C2	23-84668A05	50 ± 10%, 10 V
C3	21-83596E36	.01 – 60, – 40%, 250 V
C4	23-84538G04	15 ± 20%, 25 V
C5	8-8290SC05	003
C6	8-83813H23	068
C7	21-83596E36	.01 – 60, – 40%, 250 V
C8	8-83813H19	0039
C9	23-84782H33	10 ± 10%, 20 V
C10	23-82783B48	68 , 35 V
C11,12	21-82187B44	.001 ± 10%, 100 V
C13	21-83067A65	100 pF, 200 V
C14	21-80857A40	20 pF, 500 V
C15	21-83596E38	.0047 - 10%, 100 V
C16,17	23-84782H07	4.7 – 20%, 10 V
C18	21-82372C10	.05 – 20%, 25 V
C19	23-84538G22	6.8 ± 10%, 20 V
C20	8-83813H14	043
C21	8-83813H24	056
C22	8-83813H26	0056
C23	8-83813H27	0033 ,100 V
C24	21-83596E38	.01 – 60, – 40%, 250 V
C25	21-82187B44	.001 - 10%, 100 V
C26	23-84668A05	50 – 10%, 10 V
C27	23-84538G08	2.2 – 20, – 20% 20 V
C28, 29	21-83596E10	220 pF – 20%, 500 V
C30	8-84496D08	0068 - 10%, 400 V
C31	23-84538G02	4.7 µF ± 20%, 20 V
		diode: (see note)
CR1	48-83654H02	silicon
CR2,3	48-84618A01	silicon, hot-carrier
CR4	48-83654H01	silicon
CR5	48-82466H13	rect., silicon
CR6 thru 9,12	48-83654H01	silicon
CR13	48-83654H01	silicon
J1	9-83071K01	**connector, receptacle:** female, 12-contact
P3	28-80181B02	**connector, plug:** male 9-contact

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		transistor (see note)
Q1	48-869648	NPN, type M9648
Q2	48-869642	NPN, type M9642
Q3,4	48-869643	PNP, type M9643
Q5	48-869653	FET, type M9653
Q6	48-869643	PNP, type M9643
Q7	48-869642	NPN, type M9642
Q8	48-869568	NPN, type M9568
Q9,10	48-869643	PNP, type M9643
Q11,12	48-869642	NPN, type M9642
Q13	48-869643	PNP, type M9643
		resistor, fixed: ± 5%; 1/4 W; unless otherwise stated
R1	6-124A93	68k
R2	6-124A99	120k
R3, 4, 5	6-10621D54	56.2k ± 1%, 1/8 W
R6	6-124A55	1.8k
R7, 8	6-124A73	10k
R9	6-124C59	2.7k ± 10%
R10	6-124A73	10k
R11	6-124A83	27k
R12	6-124B08	270k
R13	6-124A77	15k
R14	6-124A97	100k
R15	6-124B04	180k
R16	6-124A91	47Dk
R17	6-124A91	56k
R18	6-124A92	62k
R20, 21	6-124A87	100k
R22	6-124C75	12k ± 10%
R23	6-124A77	15k
R24	6-124A33	220 ohms
R25	6-124A33	220 ohms
R26	6-124A73	10k
R27	6-124A97	47k
R28	6-10621D80	82.5k ± 1%, 1/8 W
R29	6-124B14	470k
R30	6-124C95	82k ± 10%
R31	6-124C29	1k
R32	6-124C95	82k
R33	6-124C49	3.3k
R34	6-124A83	56k
R35	6-124A79	39k

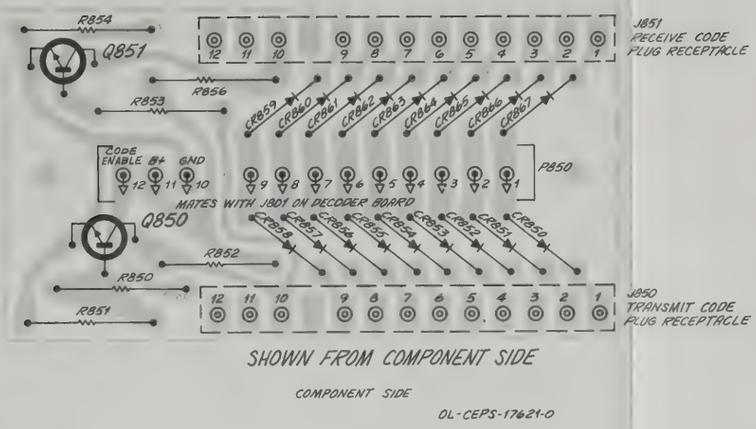
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
R36	6-124C99	120k ± 10%
R37	6-124C95	82k ± 10%
R38	6-124A89	47k
R39	6-124D02	910k
R40	6-124A73	10k
R41	6-124A49	1k
R42, 43	6-124C89	27k
R44	6-124D08	270k ± 10%, 1/8W
R45	6-124A93	68k
R46	6-124A45	560
R48	6-124C33	1.5k
R49	6-11008C91	1.2k
U1	[illegible]	integrated circuit
U2	[illegible]	[illegible]
U3	[illegible]	[illegible]
U4?	[illegible]	[illegible]
VR10	48-83696E07	voltage regulator (see note) Zener 6.2 V
VR11	48-82256C13	Zener 10 V
VR12	48-82256C51	Zener 5.1
Y1	48-83063K01	crystal, resonator, 50 kHz
		mechanical parts
	14-86196	INSULATOR, transistor
	3-10904A02	SCREW, machine M3.5 x 8 x 13.3 pan
	4-80168A01	WASHER, spring, #4 steel
	29-10271A15	TERMINAL, pin, 2-used

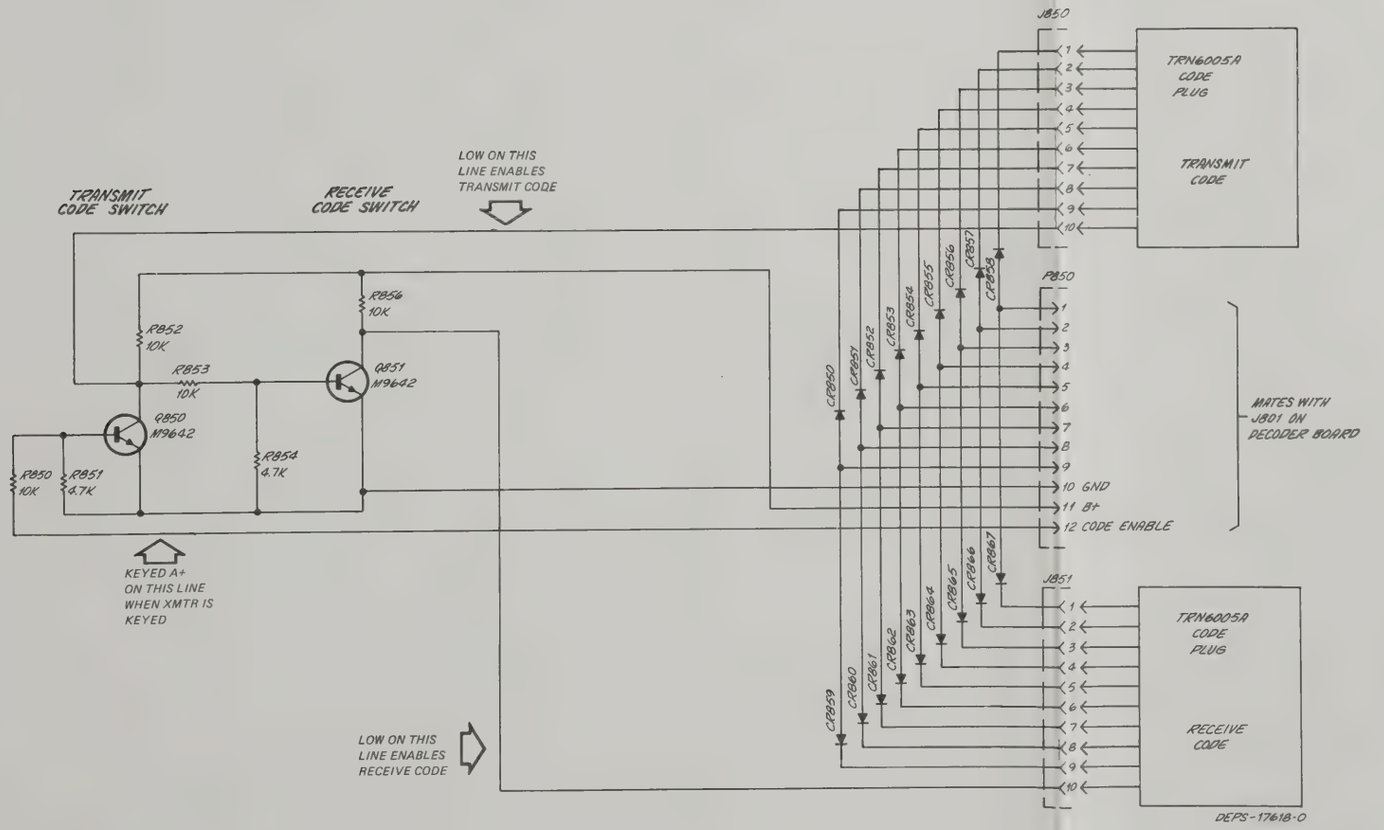
Note: For optimum performance, diodes, transistors, and integrated circuits should be ordered by Motorola part numbers

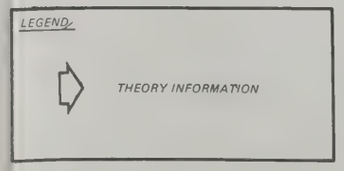
68P81039E23-F
5-9-82 GGI

"DIGITAL PRIVATE-LINE" TWO-CODE ADAPTER

MODEL TLN5730A







APPLICATION —

Plugs into code plug receptacle on "Digital Private-Line" decoder or encoder-decoder to allow separate "Digital Private-Line" codes for transmit and receive. Code plugs for the two codes then plug into the receptacles on the two-code adapter board.

PARTS LIST

TLN5730A 2-Code Adapter Board PL-3414-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR850 thru 867	48-83654H01	DIODE: (SEE NOTE) silicon
J850, 851	[illegible]	CONNECTOR, receptacle: female: 12-contact
P850		CONNECTOR, plug: consists of: 28-82070K01 CONTACT, male; 13 req'd.
Q850, 851	48-869642	TRANSISTOR: (SEE NOTE) NPN; type M9642
R850, 852, 853, 856	6-124A73	RESISTOR, fixed: 10k ±5%; 1/4 W
R851, 854	6-124A65	4.7k ±5%; 1/4 W
NON-REFERENCED ITEMS		
	1V807-4B88	CIRCUIT BOARD ASSY., incl. referenced item P850
	3-138804	SCREW, machine: 4-40 x 5/16"; 2 req'd.

NOTE: For optimum performance, diodes and transistors must be ordered by Motorola part number.

DPL TWO-CODE ADAPTER/MITREK ACCESSORIES

68P81106E97-B
5-9-82 GGI

"MITREK" CONTROL HEADS

MODELS HCN4000-11A

"MITREK" RADIO CABLES

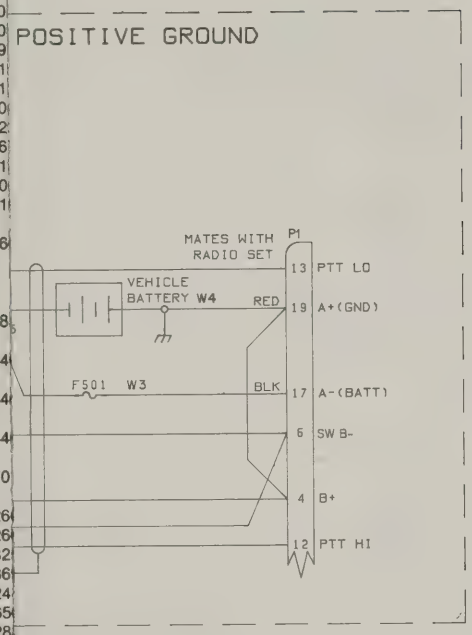
MODELS HKN4000-6A

HKN4016-22A

parts list

Low Power	High Power
HKN4000A,	HKN4016A C
HKN4001A,	HKN4017A C
HKN4002A,	HKN4018A C
HKN4003A,	HKN4019A C
HKN4004A,	HKN4020A C
HKN4005A,	HKN4021A C
HKN4006A,	HKN4022A C

REFERENCE SYMBOL	MOT PA
F201	65-860
F501	65-616
	or 65-6
P1	
	9-8010
	15-820
	15-820
	2-7019
	3-1351
	3-1321
	3-1400
	4-1172
	4-8006
	4-8211
	1-8070
	42-801
P101	
	29-826
W1	
	30-858
	30-864
	30-864
	30-864
W2	1-8070
	29-826
	37-826
	37-132
	29-136
	29-824
	29-865
	14-828
	14-828
	42-828
	41-828
W3	
	14-828
	14-828
	42-828
	41-828
	29-845
	30-858
	or 30-8
	or 30-8
	or 30-8
	or 30-8
	or 30-8
	30-812
	or 30-8
	or 30-8
	or 30-8
	or 30-8
	or 30-8
W4	
	30-858
	or 30-8
	or 30-8
	30-812
	29-845
W5	



VOLTAGE NOTES

s measured with 20 K-ohm/volt multimeter to B-.
age during receive mode is 13.8V.
age during transmit mode is 13.6 V
er Radios and 13.4V in High Power

PS-25951-C

DIO SIGNAL FLOW

NTROL SIGNAL FLOW

SSIS GROUND

IC GROUND

FUNCTION

The control head provides control of the trunk-mounted radio from the vehicle passenger compartment. It controls frequency selection, volume, and squelch. a PL MONITOR switch is provided for "Private-Line" radios. The radio cable interconnects the control head and radio and includes primary power connections.

CONTROL HEAD AND CABLES

"MITREK" ACCESSORIES

MOBILE MICROPHONE

The mobile microphone contains the microphone element and a push-to-talk switch. Model HMN4000B is packaged in a rugged weather-resistant housing; Model HMN4001B uses conventional packaging. Schematic details are shown on the control head schematic diagram in this manual.

parts list

HMN4000B Microphone
HMN4001B Microphone — PL-6059-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		cable assembly:
P102	1-84135C01	includes coil cord
		cartridge:
MK321	1-8706787	ELECTRETBOARD, preamp coated
		switch:
S318	40-82263G01 or 40-82263G02	dpst (HMN4000B) dpst (HMN4001B)
		mechanical parts
	3-13999	SCREW, tapping (6-32 x ¾"); 3 used
	3-14000	SCREW, tapping (6-32 x ¾"); 3 used
	3-135084	SCREW; 2 used
	13-83174B03	HOUSING, microphone, front
	15-82662M24	GASKET, microphone
	35-82662K01	BAFFLE, microphone
	38-84559B01	BUTTON, microphone
	42-852710	STRAP
	43-82706B01	SLEEVE, switch (HMN4001B)
	1-80701T27	HOUSING, microphone, rear; includes hangup button
	33-82599D07	NAMEPLATE (HMN4000B)
	33-82599D08	NAMEPLATE (HMN4001B)
	54-84962K01	TAG, safety
	15-82896M01	ADAPTER, microphone
	29-5355	LUG
	37-12706	GROMMET
	4-136334	WASHER, flat

note 1: Replacement parts for the rear housing assembly should be ordered as Motorola Part Number 1-80701T27. This assembly includes the hangup button.

note 2: The conformal coating on the electret preamp circuit board must remain undisturbed. The board cannot be repaired.

68P81039E26-G
5-9-82 GGI

SPEAKER

The HSN4000A Speaker provides the audio output from the radio. It is equipped with its own trunnion bracket and may be mounted on the firewall or dashboard near the radio. The speaker is mounted in a strong, weather-resistant housing.

parts list

HSN4000A Speaker — PL-6060-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		speaker:
LS301	50-84561B02	dia. 5" PM
		mechanical parts
	3-140001	SCREW, tapping; 6-7/8"
	3-84244C01	SCREW, trunnion; 2 used
	7-84568B01	BRACKET, trunnion
	13-82671M02	BEZEL, speaker
	15-84981B09	COVER, speaker base
	32-80195A01	GASKET, speaker
	38-84383D02	CAP, protective; 3 used
	29-82602D01	PIN, terminal; 2 used
	37-82603D31	SLEEVING, coded 31
	37-82603D32	SLEEVING, coded 32
	42-82018H05	RETAINER, cable
	42-84081A03	CLAMP, wire
	3-136756	SCREW, tapping; 10-16 x 5/8"; 3 used
	30-83155H01	CABLE; 2 cond

MICROPHONE HANGUP BOX

The microphone hangup boxes are used with "Private-Line" and "Digital Private-Line" radios to automatically place the radios in the monitor (carrier-squelch) mode when the microphone is lifted off-hook. Model HLN4024A is used in most installations. Model HLN4025A also contains a slide switch to place the radio in the monitor mode with the microphone still on-hook; this model is used in situations where the normal MONITOR switch on the control head is used for special functions or when used in conjunction with a carrier squelch control head.

parts list

HLN4024A Microphone Hang-Up Box
HLN4025A Microphone Hang-Up Box/W Switch — PL-6061-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		switch:
S101	40-82159D02	spst
	or 40-84198C01	open leaf (HLN4025A)
S301	40-84622B04	spst, slide (HLN4025A)
		mechanical parts
	3-139913	SCREW, tapping; 8-15 x 1/2"; 2 used
	3-129075	SCREW, machine; 2-56 x 1/2"; 2 used (HLN4024A)
	4-8406	LOCKWASHER, #2 internal; 2 used
	7-80268A01	BRACKET, switch (HLN4024A)
	14-80266A01	INSULATOR (HLN4024A)
	32-05719B01	BOOT, switch (HLN4024A)
	38-84383D01	CAP, protective; 2 used
	42-82018H07	RETAINER, cable
	15-80191A01	HOUSING, hang-up box
	4-400136	WASHER, flat; .196 x .312 x .067"
	41-867668	SPRING
	29-82602D01	PIN, terminal; 2 used
	37-80143B01	SLEEVING, coded 24/30
	37-82603D27	SLEEVING, coded 27
	3-135495	SCREW, tapping; 2-56 x 3/8"; 2 used (HLN4025A)
	64-84199C01	PLATE, mounting (HLN4025A)
	15-84626B02	HOUSING, hang-up box (HLN4025A)
	2-7041	NUT, 2-56 x 3/16"; 2 used (HLN4024A)

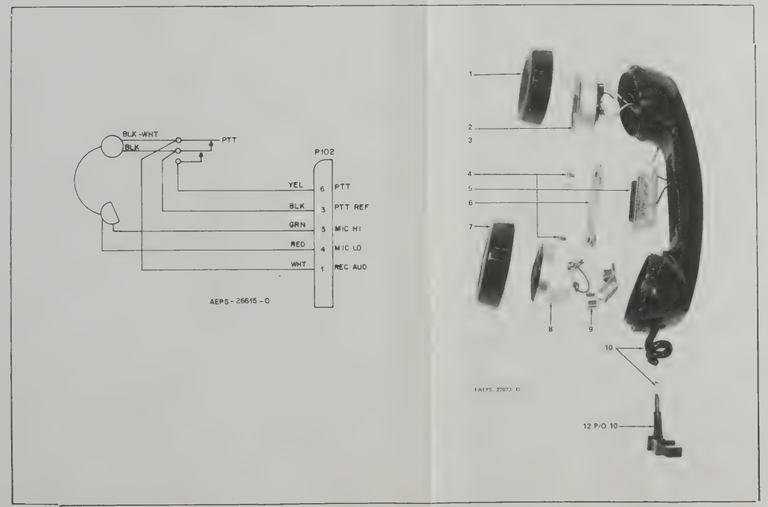
IGNITION SENSE LEAD

The optional ignition sense lead is used in systems where the green lead is connected to the battery (allowing receiver operation at all times) and it is desired to allow transmitter operation ***only*** when the ignition switch is on. This option includes the orange power lead and fuse; this lead supplies power to the radio PTT circuits when an optional jumper is altered in dc control head.

parts list

HKN4007A Ignition Switch Cable — PL-6058-B

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F401	65-890033	1-1/2 amp; 250 V
		fuseholder:
		includes:
	14-82882A01	INSULATOR, fuse, body
	14-82883A01	INSULATOR, fuse, cap
	41-82885A01	SPRING
	42-82884A01	CLIP, fuse; 2 used
		cable, power, orange, includes:
	30-10310A62	WIRE, .18 ga. stranded, orange, 66-1/2"
	37-82603D20	SLEEVING, coded #20
	29-82602D01	PIN TERMINAL
	29-136968	LUG, soldering
	29-824456	LUG, ring tongue
	29-865065	LUG, ring tongue



HANDSET

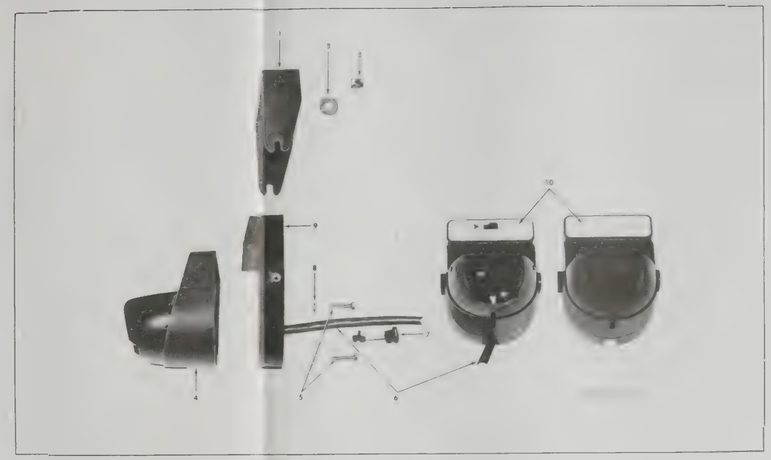
The TMN6057A Handset is used in installations where a telephone-style handset is preferred to the mobile microphone and speaker. The unit operates in the same manner as a telephone handset except that it has a PTT button which is used to key the radio.

parts list

TMN6057A HANDSET — PL-6064-A

CODE	MOTOROLA PART NO.	DESCRIPTION
1	15B84054A01	CAP, receiver (see note)
2	59C84058A01	CARTRIDGE, receiver
3	15C84059A01	HANDLE (see note)
4	3S124432	SCREW, machine; 4-40 x 1/4" "Phillips" flat head; 2 req'd.
5	40C84087A01	SWITCH, push; includes pushbutton and dust cover
6	15B84053A01	PLATE, switch cover
7	15B84055A01	CAP, transmitter (see note)
8	59B83272G01	MICROPHONE ELEMENT, telephone; dynamic type
9	7B83352H01	BRACKET, cord retaining
10	1D84519C01	CORD ASSEMBLY; includes a "molded-on" 5-contact female connector
12		CONNECTOR, plug; 5-contact; "molded-on"

note: A replacement handle, plus transmit and receiver caps, can be obtained by ordering Part No. 15C84107A01.



HANDSET HANGUP BOX

The handset hangup boxes are used (1) to automatically place "Private-Line" and "Digital Private-Line" radios in the monitor (carrier squelch) mode when the handset is lifted off-hook, and (2) transfer audio from the mobile speaker to the handset receiver when the handset is lifted off-hook. Model TLN4698A is used in most installations. Model TLN4507A also contains a slide switch to place the radio in the monitor mode with the handset still on-hook; this model is used in situations where the normal MONITOR switch on the control head is used for special functions, or when used in conjunction with a carrier squelch control head. The TLN4505A Hangup Cup is supplied with carrier squelch models.

parts list

Hang-Up Boxes — PL-6063-A

CODE	MOTOROLA PART NO.	DESCRIPTION
1	7C84566B02	BRACKET, trunnion
2	4S1724	WASHER, flat; 0.234" x 0.625" x .048"
3	3S7302	SCREW, machine; 10-32 x 3/8" "Phillips hex head
4	15C84520C01	HANG-UP CUP & SWITCH ASSEMBLY
	or 15C84520C02	HANG-UP CUP (TLN4505A)
5	3S135507	SCREW, machine; 6-32 x 3/4" "Phillips" hex head
6	1V80717B42	CABLE ASSEMBLY; includes attached insertable connector contacts (TLN4507A)
	or 1V80727B32	CABLE ASSEMBLY; includes attached insertable connector cotacts (TLN4698A)
7	42B82018H08	ANCHOR, cable strain relief
8	4S1720	WASHER; flat; 0.156" x 0.378" x .030"
9	1V80717B40	MOUNTING BASE & SWITCH ASSEMBLY (TLN4507A)
	or 58D84514C01	MOUNTING BASE (TLN4698A and TLN4505A)
10	13B84515C01	ESCUTCHEON (TLN4507A)
	or 13B84515C02	ESCUTCHEON (TLN4698A and TLN4505A)
		non-coded items
	42B82018H08	RETAINER, cable (TLN4698A)
	3S136756	SCREW, tapping, 20 x 5/8" (TLN4698A)
	38B84383D01	CAP, protective

parts list

Low Power High Power

HKN4000A, HKN4015A Control Cable (1-Freq.) 13"
HKN4001A, HKN4017A Control Cable (4-Freq.) 17"
HKN4002A, HKN4018A Control Cable, Negative Ground (4-Freq.) 22"
HKN4003A, HKN4019A Control Cable, Positive Ground (4-Freq.) 22"
HKN4004A, HKN4020A Control Cable, Negative Ground (4-Freq.) 10'
HKN4005A, HKN4021A Control Cable, Positive Ground (4-Freq.) 10'
HKN4006A, HKN4022A Control Cable, Positive Ground (4-Freq.) 17" PL-6062-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		fuse:
F201	65-86099	7.5A, 32 V
F501	65-81682	25A, 32 V (HKN4000A-4006A)
	or 65-81683	40A, 32 V (HKN4015-4022A)
		connector, plug:
P1		consists of:
	9-801050	CONNECTOR, female; 19-contact
	15-82075004	HOUSING, connector; left half
	15-82075005	HOUSING, connector; right half
	2-7019	NUT, hex; 4-40 x 3/32", 2 used
	3-135198	SCREW, machine; 4-40 x 1-1/8"; 2 used
	3-132127 or	
	3-140049	SCREW, tapping; 6-20 x 3/4"; 2 used
	4-11722	WASHER, "C"
	4-800671	WASHER, flat
	4-82113001	WASHER, flat
	1-90701752	SCREW and KNOB, assembly
	42-80158A02	CLIP, strain relief
P101		consists of:
	29-82802D01	PIN, terminal female; 15 used
		wire assembly:
W1		multi-conductor cable consists of:
	30-858513	CABLE, 13-conductor; 17' used (HKN4000A, 4016A)
	30-864650	CABLE, 17-conductor; 17' used (HKN4001A, 4006A, 4017A, 4022A)
	30-864850	CABLE, 17-conductor; 22' used (HKN4002A, 4003A, 4018A, 4019A)
	30-864550	CABLE, 17-conductor; 10' used (HKN4004A, 4005A, 4020A, 4021A)
W2	1-80701738	LEAD and FUSE ASSEMBLY (green) Includes ref. item F201 and:
	29-82802D01	TERMINAL, pin
	37-82603D19	SLEEVING, coded no. 19
	37-132582	TUBING, heat shrink
	29-136968	LUG, solder
	29-824456	LUG, ring tongue
	29-865056	LUG, ring tongue
	14-82683A01	INSULATOR, fuseholder cap
	14-82682A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82885H01	SPRING, fuse compression
W3		CABLE, includes ref. items F501 and W5 (on HKN4000A-4006A) and:
	14-82863A01	INSULATOR, fuseholder cap
	14-82862A01	INSULATOR, fuseholder body
	42-82884A01	CLIP, fuse; 2 used
	41-82885H01	SPRING, fuse compression
	29-84529B02	LUG, ring tongue
	30-858553	CABLE, battery: red; 24" (HKN4000A, 4016A)
	or 30-858553	CABLE, battery: red; 27' (HKN4002A)
	or 30-858553	CABLE, battery: red; 13' (HKN4004A)
	or 30-858552	CABLE, battery: blk; 20' (HKN4006A)
	or 30-858552	CABLE, battery: blk; 27' (HKN4003A)
	or 30-858552	CABLE, battery: blk; 13' (HKN4005A)
	or 30-812505	CABLE, battery: red; 18' (HKN4016A, 17A)
	or 30-812505	CABLE, battery: red; 24-1/2' (HKN4018A)
	or 30-851875	CABLE, battery: blk; 24-1/2' (HKN4019A)
	or 30-812505	CABLE, battery: red; 10-1/2' (HKN4020A)
	or 30-851875	CABLE, battery: blk; 10-1/2' (HKN4021A)
	or 30-851875	GROUND LEAD consists of:
W4		GROUND LEAD consists of:
	30-858552	CABLE, battery: blk; 5-1/2' (HKN4000A, 4001A, 4004A)
	or 30-851875	CABLE, battery: blk; 5-1/2' (HKN4015A, 4017A, 4018A, 4020A)
	or 30-858553	CABLE, battery: red; 5-1/2' (HKN4003A, 4005A, 4006A)
	30-812505	CABLE, battery: red; 5-1/2' (HKN4016A, 4021A, 4022A)
	29-84528B02	LUG, ring tongue (HKN4000A-4006A)
W5		Part of W3 for low power radios; HKN4000A-4006A; HKN4004A for high power negative ground HKN4004A for high power positive ground

HCN4000A thru HCN4015A Mitrek Control Head PL-6051-E

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed:
C101	23-84665F01	10 uF, ± 100-10%, 25 V
C102	23-84665F04	1 uF, ± 150-10%, 50 V
		lamp, sub-miniature:
DS104	65-83376K01	.08A; 14 V
DS105	65-83376K01	.08A; 14 V
DS106	65-83376K01	.08A; 14 V (busy light models only)
		connector, receptacle:
J101	1-80703751	female, 32-contact includes: J102 - male, 5-contact
		resistor, fixed: ±5%; 1/4 W; unless otherwise stated
R101	18-80126A03	var. 25k includes switch S101
R102	18-80126A01	var. 25k
R103	6-124C35	270 ± 10%
R104	6-124C61	3.3k ± 10%
R105, 106	6-124C73	10k ± 10%
R107	6-125C19	56 ± 10%, 1/2 W
R108	6-124A61	3.3k
R109	6-124A97	100k
R110	6-124A81	22k
R111	6-124A49	1k
R112	6-124A81	22k
R113	6-124A90	51k
R114	6-124A46	750
R115	6-124A51	1.2k
R116	6-124A57	2.2k
R117, 118	6-124A73	10k
R119	6-124A71	8.2k
		diode: (see note)
CR101	48-83654H02	silicon
CR103	48-83654H02	silicon
CR104	48-83654H01	silicon
CR107	48-83654H01	silicon
		voltage regulator: (see note)
VR102	48-82256C15	Zener type: 5.1 V
		translator: (see note)
Q101	48-869643	PNP; type M9643
		integrated circuit: (see note)
U101	51-84821K76	type M2176
		switch:
S101		on-off, pto R101
S103	40-80111A03	rotary, 5-position (5-freq. models only, see note 6)
	or 40-80111A01	rotary, 4-position (4-freq. models only)
S103	40-80127A01	pushbutton, dpdt

note: For optimum performance, diodes, translators, and integrated circuits must be ordered by Motorola part numbers.

HKN4040A Fused Lead, Positive Ground
HKN4041A Fused Lead, Negative Ground PL-6245-A

REFERENCE SYMBOL	MOTOROLA PART NO	DESCRIPTION
F501	65-81683	FUSE, 40A; 32 V
W5	—	LEAD, fused; consists of:
	30-812505	CABLE, battery: RED; 2-1/2' (used on HKN4056A, 4062A)
	or 30-851875	CABLE, battery: BLK; 2-1/2' (used on HKN4055A, 4061A)
	29-84528905	LUG, ring tongue
	9-84277801	RECEPTACLE, fuse
	3-400465	SCREW, tapping
	42-84275801	RETAINER, fuse
	38-84383D01	CAP, protection

TABLE A. COMPARATOR VOLTAGE (U101A-5)

SQUELCH CONDITION	MICROPHONE ON-HOOK	MICROPHONE OFF-HOOK
FULL SQUELCH	1.2 V	1.5 V
UNSQUELCHED	4.9 V	4.4 V

JUMPER TABLE

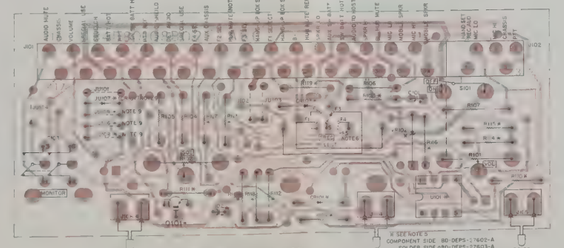
JUMPER	NORMALLY	FUNCTION
JU101	IN	SUPPLIES PTT CURRENT
JU102	IN	IN HANDSET APPLICATIONS MAY BE OMITTED TO DISABLE SPEAKER WITH HANDSET OFF-HOOK
JU103	IN	IN HANDSET APPLICATIONS MAY BE OMITTED TO DISABLE HANDSET RECEIVE AUDIO WHEN ON-HOOK
JU104	OUT	INSTALLED TO COMPLETE AUDIO MUTE PATH TO HANGUP BOX WHEN S103 NOT USED FOR MONITOR (NOTE 2)
JU106	OUT	ADDED FOR POSITIVE GROUND
JU107	IN	DELETED FOR POSITIVE GROUND
JU108	IN	DELETED FOR POSITIVE GROUND
JU109	OUT	ADDED FOR POSITIVE GROUND

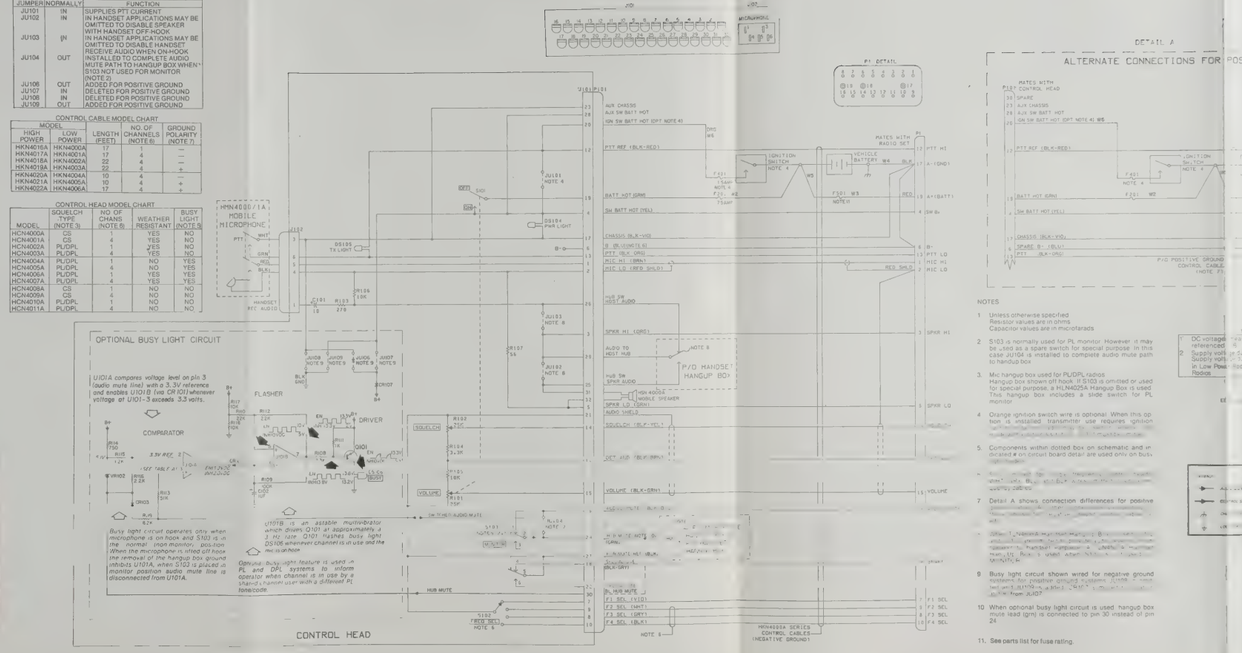
CONTROL CABLE MODEL CHART

MODEL HIGH POWER	MODEL LOW POWER	LENGTH (FEET)	NO. OF CHANNELS (NOTE 5)	GROUND POLARITY (NOTE 7)
HKN4016A	HKN4000A	17	1	—
HKN4017A	HKN4001A	17	4	—
HKN4018A	HKN4002A	22	4	—
HKN4019A	HKN4003A	22	4	+
HKN4020A	HKN4004A	10	4	—
HKN4021A	HKN4005A	10	4	+
HKN4022A	HKN4006A	17	4	+

CONTROL HEAD MODEL CHART

MODEL	SQUELCH TYPE (NOTE 3)	NO. OF CHANS (NOTE 5)	WEATHER RESISTANT	BUSY LIGHT (NOTE 9)
HCN4000A	CS	1	YES	NO
HCN4001A	CS	4	YES	NO
HCN4002A	PL/DPL	1	YES	NO
HCN4003A	PL/DPL	4	YES	NO
HCN4004A	PL/DPL	1	NO	YES
HCN4005A	PL/DPL	4	NO	YES
HCN4006A	PL/DPL	1	YES	YES
HCN4007A	PL/DPL	4	YES	YES
HCN4008A	CS	1	NO	NO
HCN4009A	CS	4	NO	NO
HCN4010A	PL/DPL	1	NO	NO
HCN4011A	PL/DPL	4	NO	NO





NOTES

1. Unless otherwise specified
   Resistor values are in ohms
   Capacitor values are in microfarads
2. S103 is normally used for PL monitor. However it may be used as a spare switch for special purpose in this case JU104 is installed to complete audio mute path to handup box
3. Mic hangup box used for PL/DPL radios
   Hangup box shown off hook. If S103 is ommited or used for special purpose, a HLN4025A Hangup Box is used This hangup box includes a slide switch for PL monitor
4. Orange ignition switch wire is optional. When this option is installed transmitter use requires ignition
5. Components within dotted box on schematic and indicated # on circuit board detail are used only on bus-
6. [illegible]
7. Detail A shows connection differences for positive
8. Busy light circuit shown wired for negative ground systems for positive ground systems JU106 + must be installed, JU107 + JU108 must be removed and wire from JU107
9. When optional busy light circuit is used, hangup box mute lead (grn) is connected to pin 30 instead of pin 24
10. [illegible]
11. See parts list for fuse rating.

VOLTAGE NOTES
measured with 20 K ohm/volt multimeter
1. DC voltages referenced to [illegible]
2. Supply voltage, receive mode is 13.8 V
   Supply voltage, transmit mode is 13.6 V
   in Low Power Radios and 13.4 V in High Power Radios

"MITREK" CONTROL HEADS

MODELS HCN4000-11A

"MITREK" RADIO CABLES

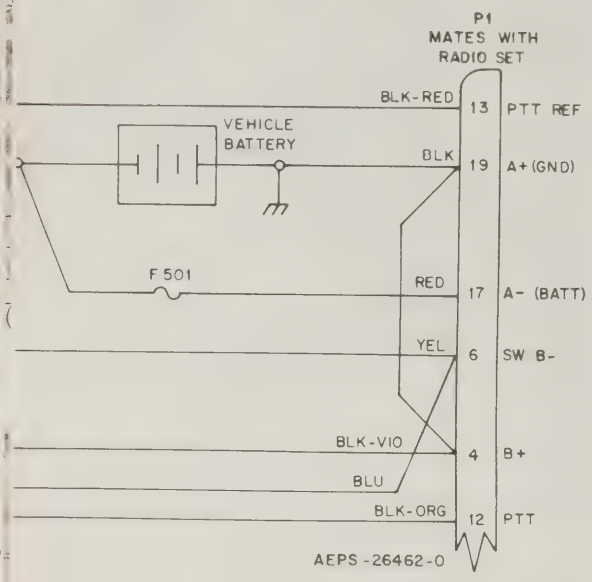
MODELS HKN4000-6A
HKN4016-22A

[redacted]

FUNCTION

The control head provides control of the trunk-mounted radio from the vehicle passenger compartment. It controls frequency selection, volume, and squelch. A PL MONITOR switch is provided for "Private-Line" radios. The radio cable interconnects the control head and radio and includes primary power connections.

GATIVE GROUND MITREK CABLE MODIFIED R POSITIVE GROUND INSTALLATION



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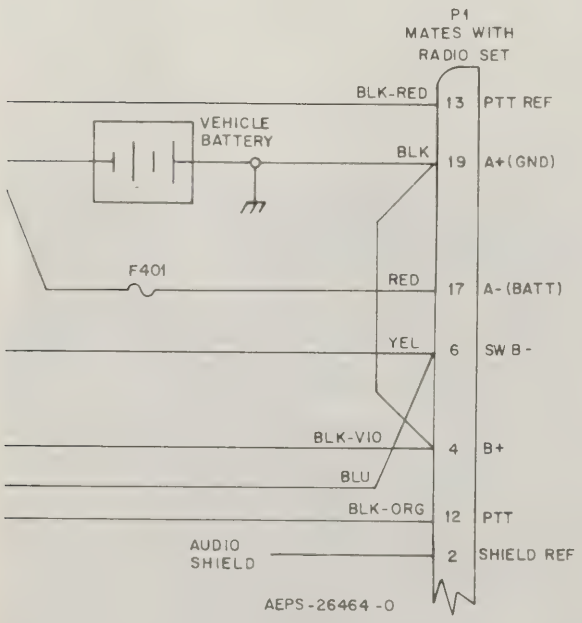

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3. ☐ Contain major errors
4. ☐ Are difficult to follow

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"MITREK" CONTROL HEAD

MECHANICAL PARTS

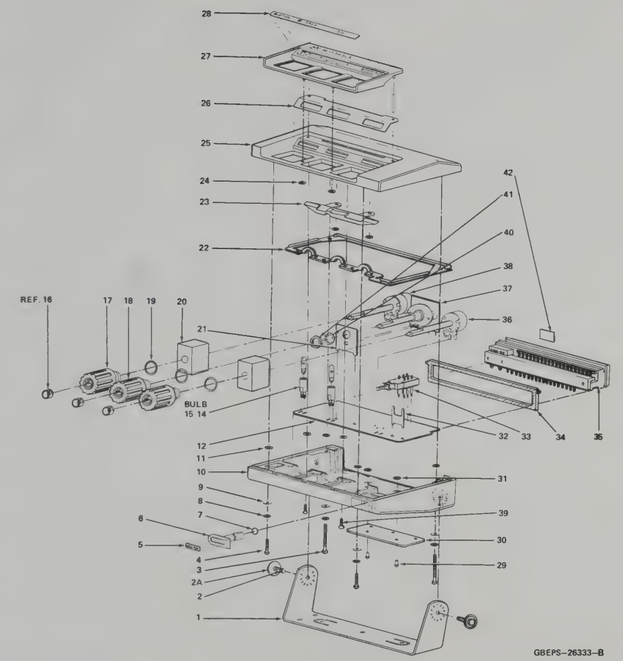
parts list

Control Head Mechanical Parts List — PL-6068-D

ITEM	PART NO.	DESCRIPTION	REMARKS
1	7-80101A01	bracket, trunnion	
2	3-135726	screw	for trunnion (two used)
2A	4-135784	washer	for trunnion (two used)
3	3-10903B62	screw, machine (M3.5 x 0.6 x 30)	for housing, rear (two used)
4	3-10903B58	screw, machine (M3.5 x 0.6 x 13)	for housing, front (two used)
5	33-80117A01	nameplate (decal)	"MONITOR"
6	36-80102A01	pushbutton	"PL" models only
	36-80102A02	pushbutton	CS models only
7	42-10128A22	"O" ring	weather resistant models only
8	4-7888	washer, lock	for housing screws (four used)
9	4-135380	washer, flat	for housing screws (four used)
10	13-80109A01	housing, bottom	
11	4-80149A01	washer, captive	for housing screws (six used)
12	84-80112A01	printed circuit board	
14	9-80051B01	light socket	w/o busy light option (2 used)
15	65-8378A01	light bulb	w/o busy light option, 2 used w/busy light option, 3 used
16	42-10082A14	retainer, knob	installed by vendor (three used)
17	36-80107A01	knob, vol., sql.	
18	36-80107A02	knob, freq.	
19	42-10128A23	"O" ring	weather resistant models only (3 used for multiple freq; 2 used for single freq)
20	32-80208A01	gasket	to isolate light (two used)
21	7-80158A01	bracket, freq. switch	
22	32-80269B01	gasket, housing	
23	61-80119A01	-ens	
24	42-10113A31	retainer, ring	for bezel and lens (six used)
25	15-80106A01	housing, top	
26	32-80140B01	adhesive strip	for bezel, non weather resistant models only
27	13-80180A01	bezel	multi-freq., weather resistant models
	13-80180A02	bezel	single-freq., weather resistant models
	13-80114A01	bezel	multi-freq., non-weather resistant models
	13-80114A02	bezel	single-freq., non-weather resistant models
28	33-80116A02	nameplate (overlay)	for bezel (1-freq. models)w/o busy light option
	33-80116A01	nameplate (overlay)	for bezel (4-freq. models)w/o busy light option
	33-80116A05		4-freq., with busy light
	33-80116A06		1-freq., with busy light
29	5-7703	rivet	for strain relief bracket (two used)
30	7-80100A01	bracket, strain relief	
31	4-7555	washer, flat	for strain relief bracket (two used)
32	7-80159A01	bracket, p.b. switch	
33		switch, pushbutton	S103, see electrical parts list
34	32-8003BC01	gasket, connector	weather resistant models only
35		connector	J101, see electrical parts list
36		potentiometer, rotary	R102, sql.; see electrical parts list
37		switch, rotary	S102, freq.; see electrical parts list (multiple freq. models only)
38		potentiometer, rotary	R101 (p/o S101); see electrical parts list
39	3-10906B04	screw, machine, flat head	for housing, front (two used) (M3.5 x 0.6 x 13)
40	4-7855	washer, lock	for frequency switch bracket
41	2-1376	nut	for frequency switch bracket
42	32-80131B01	gasket, mic	for weather resistant models only

non-referenced items

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	3-135813	SCREW, tapping: 6-15 x 1/2" ; 2 used
	3-136756	SCREW, tapping: 10-16 x 5/8" ; 3 used
	37-80118A01	GROMMET
	38-84383D02	CAP, protective
	42-10113A32	RETAINER, ring



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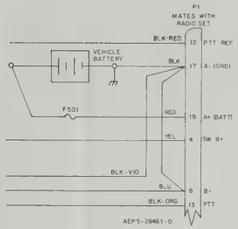
FIELD CONVERSION OF RADIO CABLES

In some instances, it may be necessary or desirable to make field conversion of cables to facilitate a particular installation. Two examples of this would be to install a new MITREK radio in a positive ground vehicle when only a negative ground cable was available or to retrofit a MITREK radio into an existing positive ground MOCOM•70 installation. In both of these the resulting cable should be clearly tagged as its wire colors will not match any existing documentation.

NOTE

When converting to positive ground, JU1 on the interconnect board in the radio must be cut.

NEGATIVE GROUND MITREK CABLE



CONVERSION PROCEDURE

Step 1. Unsolder the wires from the following pins at the connector to the radio set:

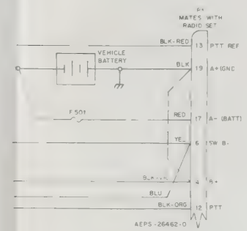
Wire Color	*Pin*
Blk-Red	12
Blk, Blk-Vio, Jumper	17
Red	19
Yel	4
Blu, Jumper	6
Blk-Org	13

Step 2. Resolder the wires to the following pins:

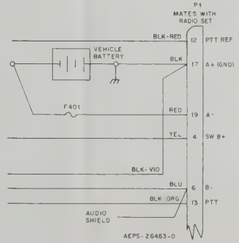
Wire Color	*Pin*
Blk-Red	13
Blk, Jumper	19
Red	17
Yel, Blu	6
Blk-Vio, Jumper	4
Blk-Org	12

Step 3. Attach a tag to the cable near the radio connector documenting the changes thatg have been made.

NEGATIVE GROUND MITREK CABLE MODIFIED FOR POSITIVE GROUND INSTALLATION



POSITIVE GROUND MOCOM•70 CABLE



CONVERSION PROCEDURE

Step 1. Unsolder the wires from the following pins at the connector to the radio set:

Wire Color	*Pin*
Blk-Red	12
Blk, Blk-Vio,	17
Red	19
Yel	4
*Blu, Audio Shield	6
Blk-Org	13

*Blu lead may be omitted on single frequency models.

Step 2. Resolder the wires to the following pins

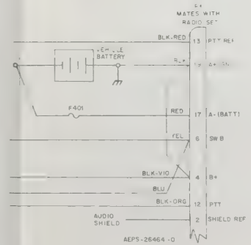
Wire Color	*Pin*
Blk-Red	13
Blk	19
Red	17
Yel, Blu*	6
Blk-Vio	4
Blk-Org	12
Audio Shield	2

*Blu lead may be omitted on single frequency models.

Step 3. Solder a short jumper (insulated #24 or larger wire) between pin 4 and pin 19.

Step 4. Attach a tag to the cable near the radio connector documenting the changes that have been made.

POSITIVE GROUND MOCOM•70 CABLE MODIFIED FOR POSITIVE GROUND MITREK INSTALLATION



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Describes the operational fundamentals of the "Digital Private-Line" system, along with circuit operation and servicing techniques.

☐ **Safe Handling of CMOS integrated Circuit Devices** — 68P81106E84
Describes special handling techniques which prevent irreparable damage to CMOS devices from static charges they receive during normal handling.

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Defines the major sources of noise in mobile radio installations and suggests remedies for them.

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Second Fold

Second Fold

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 75 ROSELLE, ILLINOIS

POSTAGE WILL BE PAID BY ADDRESSEE

MOTOROLA, INC.
NATIONAL ACCOUNTS PARTS DEPT.
1313 E. Algonquin Road
Schaumburg, Illinois 60196

PLEASE TAPE CLOSED BEFORE MAILING

COMMERCIAL WARRANTY
(STANDARD)

Motorola radio communications products are warranted to be free from defects in material and workmanship for a period of ONE (1) YEAR, (except for crystals and channel elements which are warranted for a period of ten (10) years) from the date of shipment. Parts, including crystals and channel elements, will be replaced free of charge for the full warranty period but the labor to replace defective parts will only be provided for One Hundred-Twenty (120) days from the date of shipment. Thereafter purchaser must pay for the labor involved in repairing the product or replacing the parts at the prevailing rates together with any transportation charges to or from the place where warranty service is provided. This express warranty is extended by Motorola Communications and Electronics, Inc., 1301 E. Algonquin Road, Schaumburg, Illinois 60196, to the original purchaser only, and only to those purchasing for purpose of leasing or solely for commercial, industrial, or governmental use.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED WHICH ARE SPECIFICALLY EXCLUDED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL MOTOROLA BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES TO THE FULL EXTENT SUCH MAY BE DISCLAIMED BY LAW.

In the event of a defect, malfunction or failure to conform to specifications established by seller, or if appropriate, to specifications accepted by Seller in writing, during the period shown, Motorola, at its option, will either repair or replace the product or refund the purchase price thereof, and such action on the part of Motorola shall be the full extent of Motorola's liability hereunder.

This warranty is void if:

a. the product is used in other than its normal and customary manner;
b. the product has been subject to misuse, accident, neglect or damage;
c. unauthorized alterations or repairs have been made, or unapproved parts used in the equipment.

This warranty extends only to individual products, batteries are excluded, but carry their own separate limited warranty. Because each radio system is unique, Motorola disclaims liability for range, coverage, or operation of the system as a whole under this warranty except by a separate written agreement signed by an officer of Motorola.

Non-Motorola manufactured products are excluded from this warranty, but subject to the warranty provided by their manufacturers, a copy of which will be supplied to you on specific written request.

In order to obtain performance of this warranty, purchaser must contact its Motorola salesperson or Motorola at the address first above shown, attention Quality Assurance Department.

This warranty applies only within the United States.

EPS-27734-O

MITREK™
Two-Way FM Radio
406-420 MHz and 450-512 MHz
30/50 Watts 75/100 Watts

68P81045E75-A